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The Society is not responsible, as a body, for the facts and opinions advanced in the papers published by it. Editorials are by the Editor-in-Chief unless otherwise indicated and do not necessarily represent the opinion of the Society as a whole. The "leaders" preceding major articles are to be regarded as editorial additions.

EDITORIAL

CRITICAL TIMES AHEAD FOR FORESTRY

THE immediate years ahead are of critical importance to the advance of forestry. The progress made will depend largely on how well the profession maintains its virility in the face of curtailment; how well it keeps dejection and hopelessness in the distance, and, upon the case it makes for the justification of forestry and for its own existence.

Of outstanding consequence is President Hoover's determination to reorganize the federal departments. His efforts in this direction in the past have met with no substantial results, but the circumstances that now prevail may impel Congress to act on the suggestions he embodied in his message of February 17th. In prosperous times reorganization is unpopular, but in times of stress, the public begins to show interest and demands that every possibility to save a dollar be investigated. For his courage in again bringing the subject before Congress the President is to be commended. That some reorganization is necessary after so many years of rapid patchwork growth is to be expected. The man who obstructs any realignment of his favorite bureaus when this seems desirable in the interest of economy and efficiency is a poor citizen indeed. Nevertheless he has a right to know what is to be reorganized, how it is to be done, whether or not the regrouping will actually result in economy and that the effectiveness of the work for which the bureaus were created will not suffer. Foresters have traditionally supported better planning and greater efficiency in government. They have seen to it that the Forest Service has been kept free from politics and that it works solely in the interest of the public. If reorganization of federal forestry activities promises to bring about their more effective conduct and at the same time save the government money, foresters will be for it. We know that some of it is necessary. Certainly unification is highly desirable. Just what the President plans to do with the federal forestry agencies is not definitely known but certain recent events indicate that he means to place them all under the Department of the Interior. On this foresters hold an honest difference of opinion and view the plan with alarm. Federal forestry is primarily a conservation measure and it is of great magnitude and most far-reaching effects. The Department of Agriculture, eminently successful in handling problems concerning the conservation of farm lands, has given an equally satisfactory accounting of its handling of forest land matters. By virture of its policies, experience.

tradition and the public spirit of its personnel, it is the most competent of the existing departments to administer the federal forestry work. The Department of the Interior is essentially not a conservation agency—never has been and was not created to function as such. It has been concerned principally with land disposal rather than the initiation of its wise use. Such forestry or conservation that it has been or is engaged in, is purely incidental or has been thrust upon it. To place the Forest Service, charged as it is with the best and most constructive management of forest lands for the public, into a Department which is traditionally unsympathetic to such use, is to make it an official stepchild and is too likely to endanger the very purpose for which the national forests were created. Unless the Administration can offer a better way to reorganize and unify federal forestry work than to put it all in the Department of the Interior, we must insist that the Forest Service be left in the Department of Agriculture. The President suggests that "There is little hope for success in this task unless it is placed in the hands of some one responsible for it, with authority and directon to act." Let us hope that this individual will possess understanding of the aims of foresters and confidence in their unselfish interest in the Nation's present and future public or private forest lands.

Of great consequence also, is the certainty that federal and state forestry departments will suffer material reductions in the funds appropriated for the conduct of their work. Expenses of government are beyond all reason and it is inevitable that they must be reduced. Forestry must bear its share of reduction. Here again we must take a constructive and helpful attitude. Forestry work will suffer, of course, in that it will not expand; but lack of growth is not necessarily synonymous with stagnation. Some desirabl constructive jobs may have to be throwr overboard; but the energy thus saved bec comes available for the more thorough treatment of the absolutely essential and necessary ones that must be retained Forestry has grown rapidly and substan tially. Some expansion doubtless has been at the expense of work already bee gun. It will not hurt it to stop a littl structural growth temporarily to develop firmer muscle and sinew. This is a time for searching self-inquiry; for a review of policies, objectives and methods; for gathering in loose ends and for the con solidation of gains; for weighing the worthwhileness of this or that function for impressing on the personnel that a government job is no safer than one in private employ for the man of limited energy and ability; for developing a bet ter sense of proportion and a much needed sense of humour. The times offer a great opportunity for real construc tive internal accomplishment. Fortunate i is that in state and federal forestry bureaus the personnel is so uniformly well-trained intelligent and public spirited. It is a safe prediction that it will accomplish more of fundamental and substantial sig nificance under the calming stress of cur tailment than under the nervous tensior of expansion. The federal governmen and some of the states have been very good to their forestry bureaus the pas dozen years. We can afford to reciprocat at present and be moderate and fair in our demands. Our coöperation will be more certain of friendly recognition when times have improved.

Hard times hurt alike individuals and organizations. They are particularly hard on those aggressive ones that strain t accomplish something and chafe under re trenchment. Adversity and restraint seem to be necessary adjuncts to good training

GOVERNMENT REORGANIZATION

By HENRY S. GRAVES

Dean, School of Forestry, Yale University

The proposed reorganization of federal departments has a vital bearing on the future of forestry in this country. Shall forestry be divorced from the Department of Agriculture? Is any other existing department qualified to carry on the work toward the same objectives? Is a new department necessary? Dean Graves discusses these questions. He believes that those activities relating to the protection and conservation of the soil and its products should be unified in one department and that the Department of Agriculture is the natural and only competent agency to handle them properly.

THE ENTIRE FORESTRY profession is vitally interested in the proposals now before Congress for the reorganization of the federal departments, bureaus, and other agencies. The unification of the activities relating to the conservation of natural resources will occupy a prominent place in the discussions in Congress and is likely to be one of the most controversial subjects. Action which affects the place of forestry in the government organization will have a powerful and perhaps a determinative influence on the progress of the forestry movement and opportunities for effective service in the country.

Any readjustment in the departments that would result in a change of objectives and policies in the administration of the national forests or which would violently dislocate the present organization of the Forest Service would have profound consequences in public forestry and might set back the entire forestry undertaking in the country for many years. Unfortunately some of the proposals now being made would, in my opinion, have precisely this result.

Some reorganization affecting forestry is inevitable and desirable. It is unnecessary to recount the embarrassments in the handling of the national forests due to lack of harmony in policy between the Departments of Agriculture and Interior in such matters as park boundaries, transfers of national forest areas to the national park system, range management, adjustment of claims in national forests, and legislation relating to the public domain. Repeatedly the basic approach to these problems by the two departments has been at variance. It is not a question of lack of friendly coöperation among the officers of the several bureaus, for such coöperation is in constant evidence. But the differences are fundamental, relating to policy and objectives in jurisdiction, administration, and manner of securing the best development and use of various types of land with which the government is concerned.

Some changes in organization are desirable in order to secure a better coördination of effort in closely related activities than at present. If such changes will improve public service, remove obstacles that impede progress, and set forward forestry and allied public undertakings, they should be approved by our profession. On the other hand, foresters and the friends of forestry should vigorously oppose changes that would alter the basic objectives of the national forests, or threaten the integrity of system itself, or transfer the responsibility of administration of these national properties from the government to the states or groups of states, or separate the administration of the national forests from that of other forestry responsibilities of the federal government.

Reorganization in conservation matters has been agitated for many years. Soon after the Ballinger-Pinchot controversy

there was considerable discussion of transferring the Forest Service to the Department of the Interior. Many persons associated with the Interior Department were never reconciled to the transfer in 1905 of the administration of the public forests to the Department of Agriculture. The agitation for the removal of the Forest Service, or at least of the administration of the national forests, from the Department of Agriculture has continued; it was especially prominent during the regime of Secretary A. B. Fall as Secretary of the Interior; and it has been revived in very acute form under the present administration.

After the War the associated engineers of the country inaugurated a movement for the establishment of a Department of Public Works. A National Public Works Department Association was organized to promote this proposal. A plan of reorganization was drawn up, designed to assemble in the new department all agencies having engineering and public works functions. The plan and argument were presented in a pamphlet in 1919. The Forest Service was to be transferred to the Department of Public Works on the ground that "in the first place, forest reserves are unquestionably public works. They are properties owned by the government and set aside for public purposes. Second, the harvesting of lumber, fire prevention, the construction of roads and trails, conservation of water, and the administration of water powers are unquestionably engineering operations."

The authors of the pamphlet analyzed the Forest Service budget and found that the cost of these functions exceeds that of other functions of the bureau and concluded that the administration of the national forests is essentially engineering. In the entire discussions at that time and in the above mentioned document there was a complete failure to recognize the basic principles guiding the administration of the national forests, or that the large expenditures for engineering work were for highways whose construction was supervised by the Bureau of Public Roads.

It soon developed that there would be little chance of the establishment of a separate Department of Public Works. It was then proposed that the Department of the Interior be reorganized, with two great divisions. The first would be a division of public works; the second a division of public lands or of conservation. The Forest Service, Biological Survey, and Bureau of Public Roads would be transferred to the Interior Department.

The foregoing events are of importance in the interpretation of the situation today. There is a determined effort to move the Forest Service from the Department of Agriculture and to place it in the Department of the Interior or in some new unit, as for example, a Department of Conservation or of Public Works. Some of those backing this proposal are unsympathetic with the policies of the Forest Service and would like to see a change of policy and of organization of the federal forestry work. Others—and probably the majority—are merely uninformed regarding the problems, policies, and methods of the Service. The movement, however, to shift the forestry work from its present position is a formidable one and carries elements of grave danger to the future of federal forestry.

On February 17, 1932, the President of the United States transmitted to Congress a special message urging the necessity for reorganization of the government agencies. His proposals would involve a very thorough readjustment of agencies throughout the whole governmental organization. He does not reveal the details of his plan for possible shifts of bureaus but he asks authority to make the redistribution by executive order. He requests however, authority to establish eight higher positions of which half are new posts and the balance involve change

in designation and authority of existing posts.

Among the new positions requested by the President is an Assistant Secretary of Conservation. The inference may be drawn that the President proposes to concentrate the conservation activities in one of the existing departments. There is an impression, widely current, that this would be the Department of the Interior. This impression is strengthened by the issuance of an official publication, over the signature of Secretary Wilbur, entitled *Conservation in the Department of the Interior.*[1]

At this point a word should be said regarding the bills affecting reorganization which have been introduced in Congress at this session. The writer has assembled fifteen bills which have a bearing on the problems of special interest to foresters. These measures fall in five categories:

1. Grant of broad authority to the President to reorganize the departments of the government by executive order.

2. Grant of authority to the President to transfer, consolidate, and coördinate governmental activities affecting unreserved and reserved public lands, Indian lands, and their resources.

3. Creation of a Department of Conservation typified by the Hawes Bill (S. 306) which would include the Forest Service, Biological Survey, National Park Service, Bureau of Fisheries, functions of the Interior Department pertaining to reindeer in Alaska, and functions of the Departments of Agriculture and Commerce relating to the Upper Mississippi River Wild Life and Fish Refuge. The measure provides further authority to the President to transfer to the Department of Conservation by executive order "any bureau, service, office or other agency engaged in fostering, promoting, developing, or conserving wild animal life, or national forests, parks, or monuments and/or the whole or any part of its functions pertaining thereto."

4. Establishment of a Public Works Administration and the transfer thereto and consolidation therein of all public works activities of the government. One bill in this category includes in the new organization "all except the agricultural functions of the Forest Service."

5. Organization of a commission to study the governmental organization and to make recommendations for such changes as may be deemed necessary in the interest of efficient service and economy.

One joint resolution (H. J. Res. 308) calls on the President to inform Congress regarding the specific plans which he may have in mind in making changes in the present organization. This bill would seem to reflect the attitude of many persons who find it difficult, without any knowledge of the President's specific plans, to judge of the proposal to grant to him blanket authority to shift bureaus and abolish agencies by executive order. In view of the impression that there is contemplated a transfer of the Forest Service and the whole or a part of its functions from the Department of Agriculture to the Department of the Interior, and in view of my strong conviction that such a move is contrary to the best interest of the service of forestry to the country, I believe that the requested authority to make changes by executive order should not be granted. The matter of the place of forestry in the government organization is so vital that any changes affecting forests and forestry should be made by Congress after full opportunity for an expression of opinion of the people of the country through their representatives in Congress.

One of the greatest misconceptions in the minds of many persons is that conservation comprises only a small group of activities relating to forests, parks,

[1]See "Conservation and the Department of the Interior," by H. H. Chapman, in this issue. *Ed.*

recreation and wild life. Another group gives special emphasis in conservation to the prevention of waste in the use of natural resources, with less or little attention to the problem of sustained production of the renewable resources. Conservation is a generic term which embraces the proper handling of all natural resources. The most important of all problems of conservation is the production of agricultural crops. I do not ignore the problem of conservation of human resources, because this constitutes the ultimate objective of all conservation. We already have in the Department of Agriculture the greatest and most important conservation department of the government, engaged as it is in the conservation of the soil and the products of the soil, and touching more closely than any other public agency the every-day needs and welfare of the average citizen.

There is also a current misconception that the administration of forests is essentially an engineering function. The administration of public forests is the application of the principles of forestry to the development and use of forest lands. Of course there are many engineering processes involved. Most of these do not involve the services of an engineer. Engineers should be and are employed for the major construction projects, surveys and mapping, and other special work. The other activities involve a knowledge of forestry and must be conducted by or under the direction of foresters. Experience is so definite on this point in the history of forest administration in this and other countries that it is unnecessary to labor the argument.

Still another misconception is that the administration of the national forests can be separated from the other functions of forestry; that is, the work bearing on private forestry, coöperation with the states in fire protection, reforestation of depleted lands, promotion of farm forestry, and research in forestry. Such separation would be disastrous. On the other hand, the present joint handling of all these problems has been one of the greatest single factors in the advance of forestry during the past twenty-five years.

What then should be the principle of unifying the federal activities relating directly and indirectly to forests? The one sound principle, it seems to me, is that there should be consolidated under a single department head the activities relating to the protection and conservation of the soil and its products. We deal here with the protection, use, and development of land and the public benefits derived from land products. The problem includes agriculture, forestry, grazing, and the conservation of wild life; and includes also the conservation of waters as related to these resources.

I urge with deep conviction and with the strongest possible emphasis that the federal activities relating to these resources should be centralized in the Department of Agriculture. This is the federal agency that is concerned with soil protection and the use of the surface of the land. It deals with soils and the factors of soil conservation and production. It is the natural and only competent agency to handle the classification of soils for different types of land use, and the technical, economic, and social problems involved in uses of land.

The foregoing principles are expressed in the following resolution recently adopted by the Directors of the American Forestry Association:

"RESOLVED, That any reorganization or consolidation of the activities of the federal government relating to the administration of the public lands and reservations, should be based on the principle of bringing under one departmental direction the agencies which are concerned with the production and conservation of (1) crops and plants serviceable for food or environment for man and animals, and (2) plants and forests serviceable for soil

and water protection, fibres, woods, and other plant products.

"The problems of production and conservation of plant life and the problems of protection and conservation of soils and waters relating to agriculture, grazing, and forestry, should be handled through a common administrative agency. Under the same direction should be included the conservation of domestic stock and wild life whose management depends on plant foods and environment. These activities should be centered in the Department of Agriculture."

The argument is often heard that historically the Department of the Interior always has been the lands department of the government. This is very misleading. The function of that department has been the disposal of public lands and the administration of rights of way and legal status of the property. There have, to be sure, been land-use problems in connection with the Indian properties, the administration of the national parks, and of the reclamation projects. The dominant note of the department, however, has traditionally been land disposal and the administration of the laws relating thereto. The Department of Agriculture has been the agency of the government for handling the constructive problems of land use. Even now the policy advocated by the Department of the Interior in handling the remaining public domain is one primarily of land disposal, for it proposes to grant the lands to the states.

It is not the purpose of this article to discuss all the complex problems of reorganization as they relate to different bureaus. It is rather to point out what I believe to be the functional principles that should underly the consideration and coördination of the agencies dealing with the problems of soil protection, production and utilization. If this principle is followed the public may be assured that the various activities of the government relating to the closely interdependent problems of agriculture, forestry, range management, wild life, and water conservation, will be effectively coördinated. This, in my opinion, can only be achieved through the Department of Agriculture.

A people without children would face a hopeless future; a country without trees is almost as helpless; when you plant trees you are acting the part of a good citizen.

Theodore Roosevelt.

CONSERVATION, AND THE DEPARTMENT OF THE INTERIOR

By H. H. CHAPMAN

Yale University, New Haven, Conn.

This was prepared as a review of a recent document prepared by the Department of the Interior, but because of the importance and timeliness of the subject the Editor takes the liberty to present it as an article. Few writers are so well informed on the history of conservation in this country, and at the same time have taken such active part in the conservation struggle as Professor Chapman.

THE BOOK *Conservation in the Department of the Interior* by Ray Lyman Wilbur, Secretary, and William Atherton DuPuy, Executive Assistant, is a Government Printing Office publication and can be purchased from the Superintendent of Documents for $1.00. It is not, however, a scientific bulletin, but rather a treatise written in popular style in a book of 250 pages of readable print with 252 attractive illustrations, whose purpose appears to be to sell the idea to the American public that the Interior Department and conservation are one and the same thing. The subjects set forth in this book include a large array of facts well displayed to catch the interest and arouse the enthusiasm of the uninformed citizen in the work that the Interior Department is doing in conservation and thus apparently to pave the way for a future consolidation of conservation activities, including national forests, in that Department.

Misleading propaganda consists of representing a situation not as it is but as one wants the reader to believe it is. This can be done without direct falsehood by skilful omissions of facts inimical to the desired objective. The outstanding method used by the Department of the Interior in presenting its plea is to omit all reference to any other department of the government which possibly has done better work or is a more logical agency of conservation. This technique has been used with consummate skill in the above publication.

The Department of the Interior, traditionally, has been dominated by the spirit of the General Land Office, which has carried out the laws under which the 2,000,000,000 acres of public domain were granted as rapidly and easily as possible to individuals, corporations and states. The policy of retaining the public ownership of certain classes of land in the public domain was vigorously agitated in the decade 1881-90 as the most promising and possibly the only effective means for conserving the soils, forests and water from destruction caused by unregulated and shortsighted private exploitation. The objective was to check and reduce floods and soil erosion, and to restore and maintain the forest and plant vegetation on these lands by wise use of public lands under public regulation. As a measure for the conservation of these national resources such conceptions were wholly at variance with the traditional land office point of view, which was to secure development of all national resources, including agriculture, forests, grazing, minerals and water by means of private ownership. The wise use of public lands meant to the Land Office merely the intelligent classification of all lands so that their proper *private* use could be assured.

Only by securing a reversal of this policy, and substituting that of public retention and management, did the system of national forests first gain a foothold in the United States in 1891, in the time of President Harrison. The reserved timber land constituted at first an area of about 20,000,000 acres, an insignificant proportion of the forested public domain. These reserva

tions remained under the Interior Department for fourteen years, during which time President Cleveland by proclamation more than doubled the area. The lack of comprehension by the officials of this department of the purposes and possibilities of *wise land use* under permanent public ownership seeking renewal of soil resources, and the need for placing the administration of the national forests under a department whose tradition and practice dealt directly with crop production and soil conservation, was so conspicuous that in 1905 the Department of the Interior was relieved by Congress of all responsibility over the national forests, which were transferred to the Department of Agriculture. In the fourteen years of Land Office administration the total gross reservations increased only to 63 million acres. Within the next four years the gross area of national forests rose to nearly 190 million acres. The above facts are dismissed in this Department publication in one sentence, namely: "*Timberlands were withdrawn from settlement* in 1891 and a division of the Land Office administered them until the Forest Service was created, more than a decade later." (p. 241.) The reader is permitted to assume that the long struggle, which lasted until 1909, to secure these reservations and to put them under proper administration, had been settled in 1891 by withdrawal of "timberlands" from settlement.

The Forest Service, perforce, cannot escape mention in several places, but nowhere except in connection with the administration of certain national monuments (p. 103) is the fact noted that this organization happens to be in the Department of Agriculture. (See pp. 31 and 156.) The reader, if uninformed, can draw the inference that the work of the Forest Service is a part and parcel of "conservation in the Department of the Interior." In Chapter XV, the General Land Office is made to don sheep's clothing under the caption "Conservation by the General Land Office."

More surprising, however, is the fact that in Chapter IX on "Conservation of the Indian," no mention whatever is made of a piece of really constructive work in conserving Indian forests, which cover an area of 8,277,000 acres. The utter neglect of forest conservation on the unreserved forested public lands both in the United States proper and Alaska, which has marked the Land Office administration of these areas until 1930, with the one exception of the reserved land-grant lands in Oregon, is in distinct contrast to the measures undertaken by the Indian office on these Indian forests, to practice a measure of sound forestry and secure reproduction of the timber after logging. Yet so little attention has evidently been paid by the higher officials of the Interior Department to forest production that in a book whose avowed intention is to convince the public of its efficiency in conservation, no mention whatever is given to this phase of the conservation of the *land* resources belonging to the Indian.

The crux of the entire discussion centers around the efforts of the Interior Department officials to dodge the issue of the failure of this department to secure any conservation or administration whatever for the grazing resources on the remaining areas of public land totalling 178,000,000 acres in the western states (p. 41), and described in this publication and by President Hoover in a message to Congress on February 19th as a "remnant." The mystery surrounding this failure can be explained in only one way. The Forest Service in the Department of Agriculture, beginning in 1905, had rapidly produced an efficient and practical administrative system for conserving these grazing resources on the 160,000,000 acres of the national forests. They had devised regulations which overcame the difficulties of checkerboard ownership of alternate sections which the General Land Office had found an insurmountable obstacle in the years 1891-1905 (p. 40). They had restored in a large measure the produc-

tiveness of the forest ranges, settled grazing wars, protected the settler in his rights and won the support of the local public through an intelligent *decentralized cooperative plan* of grazing management. All the Department of the Interior had to do was to imitate, on the unreserved public domain, the practices thus demonstrated. Why did they fail to secure the necessary legislation?

In the first place there appears to have been a conspicuous lack of agreement within the Department itself as to the proper policy. Old General Land Office was still in command and the outcome was the passage of the iniquitous law of December 29, 1916, providing for stock-raising homesteads of 640 acres, which now by their own admission is a colossal failure with over half of the filings allowed to lapse (p. 169). In 1917 Hon. Clay Tallman, Commissioner of the General Land Office stated emphatically to the writer that it was the policy and intention of his office to dispose of the entire public domain to private owners—that they would get rid of as much land as possible under the 640-acre stock-raising homestead law, and would then devise some other method of disposing of the remainder — the "remnant," which still comprises one-tenth of the area of the nation (p. 31). This promise now bids fair to materialize, through recent recommendations of the President's Public Domain Commission.

This policy of defiant adherence to the traditions of the U. S. Land Office was announced by Mr. Tallman 12 *years after* the effective conservation practice on the national forest ranges had been inaugurated and when its practical utility was no longer questioned. Yet this most recent document, *Conservation in the Department of the Interior* calls attention to the fact that adequate control of these public domain lands has been urged *for a quarter of a century*, or since 1907 (p. 44). This looks like a case of a house divided against itself.

The second probable reason for this failure of legislation authorizing conservation of the public domain was the conflict in the Department between the "irresistible force" or the logic for consolidating the administration of the grazing on the public domain with that already in force on the national forests, on the one hand, and on the other the "immovable body" of inherent and violent resistance of the General Land Office to the idea of a possible transfer of jurisdiction and authority over this vast remaining public domain to the Department of Agriculture, with consequent loss of perquisites and prestige of said General Land Office. Every constructive effort in legislation looking to the conservation of the unreserved public domain has foundered on this rock. Yet the Secretary of Agriculture as long ago as February 7, 1910 had entered into a formal agreement with the Secretary of the Interior (Report of the Forester for 1911, p. 9) providing that lands not wholly or in part covered with timber or undergrowth, upon which it was not expected to grow trees, should be eliminated from the national forests when below the timber line. This agreement put a stop to the numerous petitions of stockmen at the time, which sought to extend the national forest areas over the grazing lands in their vicinity in order to secure the benefits of the grazing system in vogue on these national forests. It left the future fate of the unreserved public domain squarely up to the Department of the Interior.

In 1932 the Forest Service officials went on record as favoring legislation giving Congressional authority for the proper administration of the grazing resources of the public domain to the Department of the Interior. This situation reminds the writer of the attitude of the two women who appeared before King Solomon, both claiming the living child. When the King offered to divide the babe, its true mother gave up her claims in order that its life should be spared. The other claimant was willing to

see it "divided." (The Department of the Interior proposes the division of the public domain among eleven states.)

In the final analysis, this situation alone is probably solely responsible for the illogical and utterly inconsistent arguments advanced by the President's Public Domain Commission (to which Chapters 3 and 13 are devoted) to justify the grant of this "remnant" to the states in lieu of a rational and proper extension of the existing conservation program of the nation to include these lands. In these chapters (which omit all reference to the grazing practice on national forests) it is admitted that the condition of this grazing resource on the public domain is now vastly worse than it was in 1905 when President Roosevelt's Public Lands Commission Report urged prompt and effective action "if the value of very much of the remaining public domain is not totally to be lost (p. 32).

That the Department of the Interior has been fully cognizant of this need in recent years, is shown by various statements in their "conservation" publication, such as, "Fifty per cent of the sheep and sixteen per cent of the cattle of the United States are raised in the public land states. Hence, any serious depletion of the ranges which these herds graze is of direct concern to all the people of the United States" (p. 171). "The more vital end to be accomplished is the restoration of the watershed to the point where it will yield the maximum of stream flow" (p. 33). (A map of the river system is shown, emphasizing the basic interstate or national character of stream flow and irrigation problems.) "Erosion has increased by the destruction of forage crops, and the silting of streams and river flow, as an aftermath, has added to the problems of range and farm and reclamation" (p. 171). Then with an amazing perversion of logic the theory is advanced that "the new conservation proposal contemplates that the Government lands shall be turned over to the states as and when they put themselves in a proper position to handle them" (p. 42). "Areas checkerboarded by railroad lands may (then) be handled under agreements between the two parties owning them" (as they have been handled by the Forest Service for 20 years). "The theory holds that the states are competent so to take care of these lands as to get proper returns from them. The states being close to this problem can adapt themselves to the varying requirements in different sections and work out individual solutions. It may be wise to put the responsibility for handling such situations on the states rather than to leave it with a distant and bureaucratic federal government," (p. 44), thus again ignoring, as if nonexistent, the fact that the federal government in the Department of Agriculture, by decentralization and intelligent local coöperation solved, 25 years ago, these problems of local adjustment on the national forest lands under its jurisdiction. Hence, this statement can reflect only upon the demonstrated failure of the Department of the Interior to follow where others lead. Rather than admit this possibility and consequent remissness, the General Land Office is willing to grant without compensation the total remaining area of the public domain to the states, to pass as far as possible into private ownership and end forever any further possibility of national control over irrigation, floods and erosion and effective prevention of abuse of these resources.

Yet in other parts of these same chapters the need of unified control of ranges is set forth as follows: "In the event national ranges are created, careful consideration should be given to the selection of the federal agency to be charged with their administration to the end that they may be under a unified control of and under men who are intimately familiar with the condition of the ranges, wisely established customs of stockmen, the need of contiguous areas, *and the movement of*

herds and flocks from summer and winter ranges regardless of political or topographical divisions." With this sentiment the reviewer heartily agrees. But how is this to be accomplished by state ownership, when practically the entire summer range for stock within these eleven states lies in the mountains within the national forests administered by the Forest Service. If this argument has weight, national control of the desert or winter range is the answer, and with it, consolidation of both summer and winter range in the Department which has demonstrated its capacity to administer the local grazing problems and restore the ranges. The Department of the Interior is fully alive to this possibility and has with increasing persistence and acrimony sought to bring about the "restoration" of the national forests to this Department.

In a further effort to analyze the basic reason for belittling the arguments for national control of the public domain in the same publication which sets them forth, it is interesting to note that with respect to *mineral* resources no reasons are advanced and no suggestions made that these minerals be granted to the states. In effect, the argument, paraphrased, runs thus (p. 47): "We, the Department of the Interior, are willing for various reasons to grant to the states the 'remnant' of the public domain which has defied our persistent effort to place it in private ownership, and which has been abused to the point of destruction. We are *not* willing to shoulder the burden of intelligent correction of our mistakes by proper and feasible grazing control. We are willing to trust to the tender mercies of eleven individual states the vast problem of erosion and stream control, notwithstanding its interstate and national character. But with respect to minerals we beg to be excused. We should prefer to retain their control as a national heritage!"

Is the national ownership and control of oil, coal and oil shale remaining upon the public lands *more important* than stream regulation, restoration of the protective cover on the vast public domain, checking of the silting up of reservoirs and the consequent destruction of irrigation works, or the perpetuation of the supply of meat products for the increasing population of the nation? Would the states be *less wise* in the control of minerals than in public domain administration? Or is the reason for this remarkable discrimination, for which no adequate explanation is offered, to be sought elsewhere? One answer might be found in the fact that the collection of revenues from mineral leases calls for less constructive effort on the part of a "bureaucratic Washington office," while the restoration of the public domain demands a high degree of intelligence in dealing with a fundamental problem of productive use and conservation of the soil and its crops, including forest, forage and water, and will be for a long time a thankless job, calling probably for more outlay than income, and for which this department feels itself temperamentally unfitted. Unwilling to run the risk of strengthening another department by permitting the logical concentration of this distinctive class of problems in that department, unsuccessful in attempts to secure reversion of the National Forests with their grazing resources to the Department of the Interior, and in danger of incurring increasingly injurious criticism from water users, stockmen and the nation at large for failure to conserve the natural resources of the public domain, what easier solution could be offered than the grand gesture of passing this whole problem to the western states?

The problems of *conservation* are, in relative importance, primarily those of conserving the renewable resources of the soil, for upon continued productiveness

of the land, its soil, its forests, its waters, and its wild life depends by far the greater portion of our entire industrial structure. In second place comes the conservation of the exhaustible resources or minerals. The first group and its administration cannot be dismembered without serious loss of efficiency and prejudice to national welfare. All agencies having to do with the conservation and direction of the use and productiveness of the land should logically and must eventually be concentrated in one governmental department.

That the attempt of the Department of the Interior to appropriate the word "conservation" as the keynote of all of its activities has been an eleventh hour conversion is strikingly brought out by the reports of the successive Secretaries of the Interior, contrasted with the history of the movement for public retention and control of the resources of the public domain. This latter policy was first advocated by public spirited citizens, solely with reference to public lands bearing forests, as early as 1876, and found its first practical inception in 1891 in the law giving the President the power to withdraw, for forest preserves, public lands of suitable character, which in 1897 were placed under a crude form of administration, and in 1905, as previously shown, were transferred to the Department of Agriculture. In 1911 the policy was legalized of purchasing private lands for additional national forests, in the Eastern States. Following the controversy in 1910 between Gifford Pinchot, Forester in the Department of Agriculture, and Richard A. Ballinger, Secretary of the Interior, in which the former protested certain illegal claims to coal lands, and as a direct result of the coal lands investigation in 1918, the policy of retaining and leasing oil, coal and phosphate was finally adopted February 25, 1920.

Conservation as practiced by the Forest Service since 1905 meant the *utilization* of the resources on the national forests for the greatest good of the greatest number of people in the long run, and this conception was thoroughly popularized by President Roosevelt as early as 1907.

Yet in 1910 Secretary Ballinger states, "The national policy regarding the public domain has been uniformly exercised in the disposition of public lands, in selling or otherwise disposing of the remainder to private citizens."

In 1911 Secretary Walter L. Fisher, a progressive, stated that public lands should be leased for grazing purposes under the Secretary of the Interior, and referred to "the great public movement for conservation of our national resources" under full swing at that time. He also first urged the passage of legislation for the withdrawal and leasing of coal and oil lands.

In 1913, under Secretary Franklin K. Lane, land classification was emphasized in order that such lands should be *disposed of* for the *most suitable use.* This was announced by him as a new policy.

In 1915, Secretary Lane stated, in pursuance of this policy of disposal that if two bills before Congress were passed, there would be no resources in reserve (i. e., whose ownership was retained by the government), of all the vast treasure in lands, save national forests and national parks. All would pass into private ownership and thus be put to the most beneficial use.

In 1919, Secretary Lane, following the coal strike and resulting national investigation, recommended a more complete knowledge of the coal and other foundation industries, and that we should not fear national stock taking. "When any such undertaking is proposed, however, it at once appears to arouse the fear that it is somehow the beginning of a *malevolent policy called 'conservation,'* and conservation has had a *mean meaning to many ears.*" This is the second mention of the

word in the annual reports of the Secretaries of the Interior.

Mr. Lane continues, "This word should mean helpfulness, not hindrance. A conservation which results in a stalemate as between the forces of progress and government inertia is criminal, while a conservation that is based on the fuller, the more essential use of a resource is statesmanship." This was just 14 years after the full program of preservation through use had been launched on the national forests, and 22 years after the policy had been adopted under the law of 1897 on the forest reserves, which were *then in the Department of the Interior.*

It remained for Secretary Hubert C. Work in his report of 1925 to "discover" conservation for the Department of the Interior. In a pamphlet entitled *Review of the Department of the Interior,* he says, "a *new policy* of conservation has been conceived *during the past year* under the leadership of President Coolidge. Conservation should *no longer* mean *looking up* of these resources by *non-use,* but to encourage their wise use. Conservation means use, without waste, of our national resources and their intelligent distribution as to time."

In this same year in which this discovery was made, being the 20th year of the administration of the national forests in the Department of Agriculture, the government under the direction of the Forest Service, was spending $400,000, for coöperative fire protection with 30 different states which contributed in turn $1,850,000 for that purpose; was covering the entire farm woodlands area of 150,000,000 acres under coöperation for farm forestry extension, and was expending the total sum of $23,759,003.75 on its program of practical conservation of the soil resources of the United States including the national forests. Of this sum $13,800,530 or 57 per cent was for the construction of roads and trails. If this policy was actually discovered during the previous year it is the only authentic case of Diana springing fully armed from the cloven head of Jupiter. On these national forests, in 1925, the "year of discovery," there was cut and sold to lumbermen and settlers 1,038,000,000 board feet of timber, bringing in a revenue of $2,940,436 and all cut under a system of forest management by which the stands are renewed by natural reproduction. On these forests in this year of discovery by the Department of the Interior of the fact that conservation did not mean non-use, more than 8,000,000 adult animals with their progeny were grazed by over 31,000 different permittees, mostly settlers or small owners. The revenue from this source was $1,725,376. The national forest areas practically inaccessible in 1905, had by 1925 been opened up by the construction of 10,000 miles of roads and 21,500 miles of trails for saddle and pack horses. The total net area reserved and administered had during this period increased three-fold. In eleven eastern states, 2,212,285 acres of forest land had been purchased on the headwaters of streams and organized into new national forest units. Through experience gained in efforts to develop and control waterpowers on the national forests, a public policy and technique had been developed which resulted in the final creation of the Federal Waterpower Commission. Over 29,000 permits were in force for special uses including hotels, camps, summer residences, fences, reservoirs and water conduits. Over 100,000 acres of devastated forest land had been planted to trees. Fifteen hundred public camp sites had been opened and 20,000,000 people visited the national forests for recreation, hunting and fishing. (This number has increased to over 31,000,000 in 1931.) One hundred and thirty game refuges were maintained, including over 16,000,000 acres of land, and big game animals within the forests were estimated

to number 700,000. An extensive program of research into all phases of forest reproduction, growth, protection and utilization had been established at six regional stations and at the Forest Products Laboratory at Madison, Wisconsin. All this was going on under the nose of the Department of the Interior when in 1925 Mr. Work discovered that conservation no longer meant locking up national resources. Could it have been that President Coolidge presented the Secretary of the Interior with a marked copy of the Forester's annual report? At any event, the Department of the Interior had, after 20 years, suddenly realized that the American people, through intimate contact with the practical application of President Roosevelt's conservation policies as practiced by the Forest Service on the national forests, had accepted this idea, and that any governmental department having to do with public land must in turn accept it or perish. Mr. Work chose, therefore, to place his Department in the position not only of acceptance, but of original discovery.

Coincident with this announcement Mr. Work voiced his belief in the necessity of centralized departmental authority over this new field of conservation, and in his report for the year advocated the establishment of grazing districts on the public domain, a bill for which had failed to pass Congress in the previous year.

In 1928 Secretary Roy O. West states that this new policy for administering the national domains "began to take shape about 20 years ago, to put to best possible use whatever remains in public ownership."

In 1929 under Secretary Wilbur the President's Public Domain Commission was appointed and began its work of deciding what to do with the public domain.

In 1930 came the first secretarial mention of efforts to protect the timber on the unreserved public domain from fire, just 33 years after the initiation of this system on the national forests. Finally in 1931, Secretary Wilbur issues the publication which is the subject of this article. Under the policy of conservation which he recommends, the public domain would cease to be. Unfortunately, the process would not stop there, for the policy advocated by the President's Public Domain Commission would open the way for granting to the states any portions of the national forests which commissions of five men, composed of two members from the state in question, one appointed by the Secretary of the Interior, one by the President, and one only by the Secretary of Agriculture, might decide that their respective states should have. This action would be taken independently of Congress or of the President.

Yet, who knows! Possibly the concentration of authority over land use, grazing, erosion, water flow and timber production in the Department of the Interior might result in successes similar to those extolled in their administration of the Territory of Hawaii, where (p. 198) "political graft and bad government are almost unknown. Few communities approach more nearly the ideal of self government. A far away land and a strange and conglomerate people are being conserved in such a way as to produce a prosperous and happy community."

For what this department has accomplished, beginning in 1915, in the organization of an efficient National Park Service, it is to be congratulated, though it should be noted that by their very nature, the uses made of park areas must be confined to that of recreation and preservation of the natural conditions intact and therefore do not contemplate any commercial use of these resources whatsoever. In the administration of the mineral leasing law, forced on it by the Pinchot-Ballinger controversy, it has, with certain *conspicuous lapses* relating to oil leases,

had a considerable measure of success. Thanks to enlightened officials in the office of Indian Affairs, the Indian timber has for the most part been cut under forestry regulations, though the permanence of these results is jeopardized by the policy of granting individual titles to the Indians. The Reclamation Service has added appreciably to the agricultural area of the West, though in this development and especially in recent proposals for extensive colonization of cut-over lands in the South at government expense, the policies of this Service have been sharply at variance with the best thought of agricultural economists. But when it comes to land administration as a national resource, whether for forests, grazing, water, or prevention of erosion, the history of this Department does not quite justify its desire for exclusive jurisdiction and control. The well informed citizen, still cognizant of the past mistakes, omissions and even more serious failures of this department will hesitate before approving in full the claims set forth in this publication.

As an indication of this sentiment, the resolutions adopted by the Board of Directors of the American Forestry Association on February 17, 1932 may be cited.

Adequate Legislation for the Public Domain

It is believed that adequate legislation looking to the conservation, administration, and/or disposal of the public domain should:

1. Include a clear statement of federal purpose to protect and advance the public interest through the beneficial use and conservation of the grazing, forest, and other national resources of the public domain, the prevention of erosion, and the maintenance of favorable conditions of waterflows.

2. Authorize and direct the Secretary of the Interior or other appropriate department to determine by study of local conditions and by land classification the specific areas which should be retained in public ownership in the form of grazing reserves or districts, national forests, national parks, national monuments, and federal game refuges.

3. Authorize the President to withdraw lands which are considered suitable for Congress to include in national forests, national parks, and federal game refuges.

4. Authorize the President to create by proclamation grazing districts from public domain lands.

5. Authorize and direct the Secretary of the Interior or other appropriate Department to inaugurate as rapidly as is feasible an adequate administration of Public Domain lands, and to make rules and regulations for their occupancy and use in conformity to the purposes set forth under (1) above and to provide penalties for violation thereof.

6. Authorize and direct the Secretary of the Interior, or other appropriate department, after completion of the classification of the lands, to formulate a plan for the final disposal of the lands not recommended for inclusion in public reservations, whether to be granted to the states, or to be continued for disposition under existing public land laws, or for retention or disposal under new plans and procedures that may be recommended by him, consistent with the prior liquidation of all other outstanding grants, scrip, warrants or other obligations.

7. Provide an adequate appropriation for the initiation of the administration of the use of the public domain and for the proposed classification authorized in the Act.

Resolutions on Reorganization of Federal Conservation Activities

RESOLVED, That any reorganization or consolidation of the activities of the federal government relating to the administration of the public lands and reserva-

tions, should be based on the principle of bringing under one departmental direction the agencies which are concerned with the production and conservation of (1) crops and plants serviceable for food or environment for man and animals, and (2) plants and forests serviceable for soil and water protection, fibres, woods, and other plant products.

The problems of production and conservation of plant life and the problems of protection and conservation of soils and waters relating to agriculture, grazing, and forestry, should be handled through a common administrative agency. Under the same direction should be included the conservation of domestic stock and wild life whose management depends on plant foods and environment. *These activities should be centered in the Department of Agriculture.*

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"There is another general rule, with regard to pruning trees. The bough should be taken off, either by the upward stroke of a sharp instrument (and, generally speaking, at one blow), or with a saw: in the latter case, it should previously be notched, on the under side, to prevent its splitting off, in the fall. If the bough to be taken off be heavy, the safest way is, first to cut it off, a few inches from the stem, with an axe, and then to clear away the stump, close and level, with a saw; doing away the roughnesses, left by the teeth of the saw, with a plane, or with a broad-mouthed chisel, or an axe; in order to prevent the wet from hanging in the wound. A saw, for this purpose, should be set very wide; otherwise, it will not make its way through green wood."

From *Planting and Rural Ornament,* Anon. London, 1796.

CAMPS FOR THE UNEMPLOYED IN THE FORESTS OF CALIFORNIA

By R. L. DEERING

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This article is more than a mere description of what one state is doing to alleviate the distressing unemployment situation. In it lies the germ of an idea that can be developed to proportions of great national social benefit. The forests afford an ideal reservoir of work that can be tapped with very little effort in an economic emergency. Indeed, since unemployment exists to some degree even in prosperous times, the managers of public forests might well regard unemployment relief one of their duties and so plan their improvement projects to give work to worthy jobless men willing to work for their food and shelter.

THE NORMAL WINTER flow of itinerant labor into California is heavy mainly, perhaps, because of the relatively mild winter climate of the valleys and lower elevations of the state together with the attractions held out by the fairly large centers of population where the lumberjack and farm laborer can enjoy the amusements that are for the most part denied him during the summer. This winter drift draws men from all over the West, Middle West and South. When conditions are normal the itinerant starts the winter with his summer savings and if he uses these wisely he has about enough to exist on until his seasonal employment opens up again.

Because of conditions in industry in 1931 the influx of unemployed men into California started much earlier than usual and brought into the population centers by train and dilapidated automobiles a tremendous number of persons in rather destitute circumstances. There were such hordes of men riding the freight trains that the companies as a general thing did not try to put them off. This fact gave the box-car tourist crop of the state a nationwide complexion.

In order to get a measure of the number of itinerants who were entering the state a careful check was made of the train and automobile travelers at or near the points of entry. It was found that some 37,000 persons with little or no cash came in during September and about 39,000 in October, 1931. About 80 per cent were found to be boys between the ages of 18 and 25.

Local relief problems assumed serious proportions and the particularly troublesome feature of the situation was that so many of the persons in need were not residents of the state. The normal job of caring for destitute citizens of California was thus greatly augmented.

With the numbers of men in the bread lines of the cities becoming larger daily, it became evident by October that something must be done to curtail the influx of further unemployed persons through making it clear that all such individuals who came in must expect to work for their upkeep. It was also desired to use the available labor on something productive if this could possibly be accomplished.

All local opportunities were already being utilized for the men with dependents so it was necessary to turn to the areas at greater distances from population centers where single men could be transported and employed. For various reasons there seemed to be little chance that the men could be employed to manufacture products that could be sold to help to defray the cost of their sustenance. The idea was then advanced that their services be utilized in the forest and watershed areas of the state where in return for their food and housing they could do worthwhile work on fire pro-

tective improvements such as snag felling, roadside clearing, firebreak construction, burning of down logs, insect control work and in some case the building of roads. The scene of operations was to be in the forested and brush regions within and adjacent to the national forests and in the Coast redwood country.

The Governor of California, who took a great personal interest in the problem, appointed a committee late in November, 1931, to work out the details of this general plan. Represented on the committee were most of the conservation interests of the state as well as city, state and federal agencies that could be expected to help solve the problem. The chairman was the secretary of the California Forest Protective Association and he has given freely of his time and of the resources of this organization in carrying on the project.

From a small start in December, there were, by the end of the second month, some 25 forestry camps in operation which were taking care of about 1,500 men, and funds were still available for an increase in numbers up to 2,500 men, the full capacity of the camps then established. It is hoped they can run until perhaps the middle of March when it is believed some of the industries will resume operations and will begin to attract the men back to their seasonal jobs.

Because the projects to be handled were for the most part at comparatively high elevations it was considered highly desirable to secure the use of permanent housing facilities, therefore the camps have been established in old construction or logging buildings wherever these could be secured. This was not possible in all cases and at least two temporary barrack camps have been built at a low cost and a few tent camps are in operation.

The man power has been recruited from the bread lines of the cities through purely voluntary means. Local supplies of such men were used in many cases and when these were exhausted the larger concentrations in San Francisco and Los Angeles were drawn on. Naturally, not all of the men in the bread lines want to work for their keep nor are all able to do so. However, thus far practically no difficulty has been experienced in securing the men desired for the camps and the percentage of men who are not only willing but anxious to work on this basis has proved to be very large. All of the personnel of the camps, including such skilled help as bakers, carpenters, cooks, and truck drivers, has been recruited from the same general source and serves without compensation. The cost of subsistence has been borne largely by the state and has been under 30 cents a day in many of the camps. The local agencies from which the men are recruited ordinarily transport them to the camps or to the nearest railroad point thereto and in many cases have paid a small sum to help to defray the cost of the undertaking. Medical examinations are given before sending the men out to be sure they are fit for the work and that they have no communicable diseases. After the crews arrive on the jobs the local county health officers have in many cases assumed their medical care. The Red Cross assisted in first-aid training of the supervisory forces in the camps and it was often possible to find in the personnel of the unemployed group men qualified to give emergency medical attention.

The supervisory officers who have been in direct charge of the camps have been supplied from the paid, yearlong forces of the State of California for the camps in charge of the state and from similar officers of the U. S. Forest Service for the camps within and immediately adjacent to the national forests, which are under federal supervision. Two qualified men have been detailed to be in charge of the service of supply, one of whom was loaned by the national guard and one by

the state. The truck, tools and camp equipment have been furnished almost entirely by the state forester's organization and by the federal Forest Service out of existing stocks with a few purchases made of essential equipment that could not be secured otherwise.

The men are expected to work six hours a day, including travel time to and from the camps to the places of work. They are given two well-cooked, plain but substantial meals a day with a lunch out on the jobs when these are so far away that return to camp at noon is out of the question.

Many problems have arisen and so far have been fairly successfully solved. For example, many of the men did not have suitable shoes, underwear, clothes and coats for the strenuous winter work. These needs were met by donations or, in many cases, by direct purchases of new equipment out of funds furnished by assisting agencies.

The camps have been self-governing and many of them have adopted strict rules of conduct enforced by the men themselves. "Kangaroo" courts have been organized in some of the camps and mete out speedy and stern justice against men who have not lived up to the camp rules. Most of the camps have been held to a maximum of 200 men in the interest of health and to simplify the housing and sanitation problems.

The type of man has been generally of a high order. Few of them have shown anything but the greatest willingness to work. The few sluggards and agitators who have gone into the camps were eliminated promptly.

In order to keep up the morale of the men and to give them as much as possible to amuse and occupy them in their leisure hours, games, reading matter, and in some cases radios and phonographs have been supplied through donations made in response to public appeals.

The attitude of the men themselves has been excellent. Apparently they have appreciated the effort made to give them an opportunity to be self-sustaining. They have kept their self-respect far better than they could were they walking the streets of the cities and having food handed to them from the soup kitchens. Physically, too, they will undoubtedly finish the winter in much better condition than would otherwise have been the case. One camp which has been located in the middle of a small town for some time has not had a single case arise of complaint against any of the men.

The State of California and local agencies have taken a broad view of the situation and have made no distinction between their own citizens and those from other states who are now in their midst and in need, since they have felt they have a responsibility to society that could not be dodged. One bright spot in the situation was that it was an opportunity to get done a lot of the protective improvement work that was recognized as badly needed but left undone in the past because of lack of funds. Here again a broad view has recognized the interest of state and communities in bettering protection on the national forests. Should the financial difficulties continue it is not outside the realm of possibility that our summer fire protective forces might be augmented by assembling the unemployed in camps in the summer where they could be housed and fed at relatively small cost and used on hazard reduction or forest sanitation work when not engaged in suppression work. Thus the national forests could serve a still more important part than they have in the present project in the useful occupation of very large numbers of unemployed at a low cost during periods of economic stress on productive work looking toward the development and protection of the forest areas.

The project is a fine illustration of effective coöperation between federal, state and local governments, accomplished with speed and economy and without serious difficulties due to questions of jurisdiction or authority.

The wholehearted assistance rendered by almost everyone called upon in the emergency as well as the fine attitude of the men have been the real factors in making the undertaking the success it appears to have been thus far.

Advocates of selection of forest tree seeds from localities having similar climatic conditions to those in the region where the seeds are to be planted will find encouragement in the findings of LeClerc and Leavitt (Bull. 128, Bureau of Chemistry, U. S. Department of Agriculture). As a result of tri-local experiments with wheat, the investigators conclude: "The practice of trying to improve crops in one locality which crops are to be grown in another locality of widely different climatic conditions should be discouraged. Crops should be improved in the locality in which they are intended to be grown, or the seed should be selected from a region which has similar climatic conditions."

Another valuable suggestion may be gathered from Dr. George L. Streeter of the Carnegie Institution. In the June, 1931, issue of *Scientific Monthly* he presents a readable and informative summary of facts about development of the egg through all stages from a single cell to full development. Dr. Streeter shows that eggs are not all alike, so that the farmer has learned to be very particular about the kind of seed he plants. Regulating the severity of environment controls the number of frog's eggs that develop. It is normal for component elements of the egg to differ among themselves in such qualities as endurance, vulnerability and capacity for growth. They also vary in different eggs, and some differences are hereditary. The span of life in any individual organism is determined by two opposing factors, namely the initial energy or quality of the egg and the resistances it subsequently encounters.

S. B. Detwiler, *U. S. Bureau of Plant Industry.*

SEATTLE'S WATERSHED CONTROVERSY

By B. E. HOFFMAN

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Is logging compatible with watershed protection? The courts of the State of Washington believe it is in deciding against Seattle's contention that the forest is a necessary and integral part of its water system. A large mass of scientific and quasi-scientific arguments were presented though most of the testimony seems to have been opinions. Both sides employed well-known foresters as expert witnesses. The conflicting nature of the testimony in this first big case involving forest influences, points to the inconclusiveness of much of our knowledge concerning the effect of forests on precipitation, run-off, air temperature, and erosion. In attempting to give an impartial description of the case the author makes no critical comments on the arguments offered. For these the student of forest influences must consult the court records. He would find them stimulating.

LATE IN THE YEAR 1930 the City of Seattle went to court in an attempt to rid the watershed supplying its domestic water of lumbering operations. The special nature of the case, the adverse findings of the court, together with the history of the development of the water utility which formed the background for the action taken, present several unusual features which make it of interest to foresters. This article is an attempt to present the main facts as brought out in the testimony of this court case as well as the court's decision. The author has refrained from injecting his own opinions and conclusions on these facts. It is to be remembered that this was a case dealing with the peculiar conditions of rainfall, temperature, elevation, forest and soil conditions as found on the west slope of the Cascades.

The watershed involved is that of Cedar River, a sizeable stream about 45 miles long heading at an altitude of 3,500 feet near the summit of the Cascade Range, within the Snoqualmie National Forest southeast of Seattle and flowing into the southern extremity of Lake Washington, a large fresh water body bordering the eastern limits of the city.

The Watershed

The water supply drainage embraces in round figures 91,000 acres, a very large part of the entire watershed. The intake is at Landsburg on the main river about 23 miles from the city limits. About 13 miles up the valley from the intake is Cedar Lake, which is about 3.5 miles in length, has an average width of about one-half mile and is of great depth.

The drainage of this lake which includes the main headwaters of the river and important feeder streams, embraces a total area of about 51,000 acres. It is the important catchment basin of the utility and is commonly known as the "upper watershed." The remainder of the city watershed will be hereafter referred to as the "lower watershed."

The lake was formed through glacial agencies, the terminal moraines of which were deposited in the former deep rock-walled valley, to form a part of the supporting formation at the north and lower end of the lake. This porous moraine material permits of heavy seepage from the lake and has been the cause of much trouble in connection with the attempt to raise the water level. This factor complicates the measurement of run-off.

The greater part of the upper watershed is of comparatively rugged topography. The lower slopes are long, abrupt, and form many sharp, lateral ridges, with short deep canyons between. The lower watershed is of more gentle topography. The higher elevations of the upper watershed range from about 4,700 to 5,200

feet, the lake lies at an altitude of 1,550 feet and the intake at Landsburg is about 650 feet above sea level. The soils of the watershed are characteristic of the prevailing class of soils found on the west slopes of the Cascades. The surface loams are quite largely underlaid with gravel or other formations of porous texture which are easily penetrated by water.

The main line of the C. M. & St. P. Railway and a branch of the N. P. Railway cross the lower watershed and within the same drainage there are several small habitations.

Forest Cover

The watershed lies within the zone of the better stands of commercial timber in the Douglas fir region. Before logging operations began the water supply basin was quite uniformly and completely covered with heavy mature timber stands. The forest below the 3,000-foot contour consisted principally of Douglas fir, with varying porportions of western hemlock, western red cedar and other species. Based on market conditions of the past 20 years, these stands covering nearly two-thirds of the entire drainage basin were practically all loggable.

The forest types above the 3,000-foot level consist mainly of hemlock and true firs with varying proportions of Douglas fir, cedar, etc. The stand for the most part is dense, but owing to the low quality and small size of the trees at this elevation the greater portion of the timber is not now operable.

As a result of lumbering operations which started before the city's entry into the watershed, there had been logged at the time of the court action (November 1930) a total area of over 40,000 acres, about 7,000 acres of which is in the upper watershed around the lake and on the adjacent bottom and slopes.

The remaining uncut timber in the upper watershed which is loggable under a normal demand is roughly estimated at 600 million board feet. An additional but much smaller quantity of loggable timber remains in the lower watershed.

All of the cutting has been of the clear-cutting system, universally practiced in the Douglas fir region. Although there is some divergence of opinion in regard to the results of natural regeneration, the greater part of the logged-off areas in the lower watershed are now well stocked with reproduction of varying sizes from one foot to over 30 feet in height. In places it is dense and within 10 to 15 years will have formed a closed canopy over very considerable areas. Recurring fires of several years ago, the dry weather period of the past decade and a deficiency in seed crops have seriously retarded regeneration, on 10,000 acres or more in the southern portions of the cut-over area including that in the upper watershed. It is here that the planting program initiated by the city in 1925 is being put into elect with a reasonable degree of success.

Development of the Water System

The city took official action to extend its water supply system to the Cedar River watershed in the year 1895. The pipe line and headworks were completed so that water was first diverted to the city mains early in 1901. Along with the development of the water utility the city set out on a hydro-electric project in the same watershed. For the latter purpose the "Crib Dam" was completed at the outlet of Cedar Lake in 1903 and a power plant completed the following year.

This project was extended with the completion of a masonry dam located about 2 miles below the lake in 1914. The Crib Dam raised the lake about 17.5 feet and the masonry dam provided additional head. The small raise in the water level provided by the dam developed a heavy seepage through the gravel moraine at the

Map of the Cedar Lake Watershed furnishing domestic water for the city of Seattle.

lower end of the lake, consequently the project to increase the reservoir capacity was only partially successful, dependent upon the sealing of the porous formation.

The attempted raise of the lake level with the masonry dam was marked by a noteworthy and disastrous event on Christmas Eve in the year 1918. The raise created sufficient seepage to form a blow-out through the porous moraine bank (divide of the basin at this point), tearing out railroad tracks and practically wiping out a small town in the adjacent drainage below.

It is important to note at this juncture that this seepage factor is a point of significance in the case in court, since it is apparent that the rate of run-off at the dam becomes greater each year as the loss from seepage above decreases due to the sealing process. In other words, the change in amount of seepage from year to year and for periods of years complicates the problem of determining run-off as affected by removal of the virgin forest cover. Gauging of the water flowing past the dam was presumably accurately done, while the excessive seepage caused by the raised water level is not subject to accurate measurement, and present information on it is only opinionative.

Coincident with the growth of the city, the water system has naturally grown to large proportions and represents a book value of over 20 millions of dollars. It is interesting to note from the court testimony that the capacity of the system in 1901 (22,500,000 gallons per day) had grown to 115,000,000 gallons in 1929. During the latter year the average daily consumption was 54,000,000 gallons, with a "summer peak" daily consumption of 110,000,000 gallons.

Management of the Watershed

Upon the entry of the city into the Cedar River watershed action was taken to inaugurate a sanitation program. This was no simple matter since the area was then in close proximity to railroads and lumbering operations within the watershed were already in progress with their incidental habitations so located as to present a serious sanitation problem. The problem was further complicated by the extensive ownership of private land and timber strategically located with little or no city ownership. Publicly-owned lands, particularly national forest areas, were located principally in the higher, more remote parts of the drainage so that they were not the key to the immediate problem. The aggregate area of national forest ownership was about 20,000 acres or slightly over one-fifth of the watershed.

To acquire at the outset all or substantial parts of the private land with timber or the lumbering plants, would have required an investment of several millions of dollars, which the officials of the city apparently considered too great a financial undertaking and also that complete control was economically unjustified. The council therefore set out to introduce sanitary measures within the watershed, provide fire protection to the forest, restrict the expansion of lumbering operations and gradually acquire land control through a progressive but rather modest program of purchases.

The acquisition of lands by the city began in a small way and extended from year to year until in 1930 the city owned practically all of the land (not timber) in the lower watershed and the greater part of the private land (not timber) within the upper watershed.

The policy of the city, as indicated by performance throughout the occupation of the watershed up until very recent years, was that of acquiring land control without a cessation of logging operations rather than to acquire both land and the remaining merchantable private timber, with the object of retaining all of such

timber for the benefit of the water utility, or providing for a modification of the existing cutting methods.

Logging under the clear cutting system has been continuous, the present and only remaining operation in the watershed being that of the Pacific States Lumber Company of Tacoma.

Among a number of transactions involving timber which it had purchased, the city in 1917 entered into a contract involving the sale of several thousand acres of city timber in the upper watershed to the Pacific States Lumber Company and granting use of such city lands as was essential in the logging of either city timber or any adjacent additional timber that might be purchased by the company.

The contract specified clear cutting and required the logging of at least 40 million board feet annually after the first year.

The above company's operations, then located in the lower watershed, were moved into the upper watershed near the lake and cutting started in the year 1918.

The main line logging railroad extension necessary in this move involved the construction of a bridge 200 feet in maximum height and 800 feet long, being one of the highest and most expensive wood structures of its kind in the West.

The logs go to supply the company's mill located about 20 miles away just within the drainage basin, as well as the open log market on Puget Sound.

Up to the time of the trial in 1930, this operation had removed the timber from a total area of approximately 6,400 acres in the upper watershed. An additional area of about 600 acres around the lake had been cut over by the city.

This specific cut-over area is one of the important factors in the case.

Forestry Practice

While city officials had from time to time given consideration to the idea of a more elaborate program for the acquisition and management of the forest resources of the watershed, really the first official action toward the formulating of a comprehensive forestry policy was taken in the year 1925. At this time the council, upon the recommendation of a commission of five members including Supervisor W. G. Weigle, of the Snoqualmie National Forest, authorized the inauguration of an up-to-date and progressive plan of management for the watershed. The plan adopted was based upon the recommendation of Dean Hugo Winkenwerder of the University of Washington and Allen E. Thompson, a graduate forester, now City Forester. The major provisions of the plan were as follows:

1. Acquisition of all timber and land (except government) in the upper watershed above 3,000 feet in altitude.
2. Steps be taken to limit cutting with the objective of sustained yield management.
3. Leaving seed trees for natural regeneration.
4. Provision for a planting program.
5. Better fire protection.
6. Improvement in sanitation program.

Progress made so far in carrying out the program is represented mainly in planting, more effective fire protection, and sanitary measures. A substantial and creditable showing has been made in all of these phases of the program, it being worthy of note that a nursery has been established and planting done on several thousand acres where on account of accidental fires or other causes natural regeneration following cutting has been inadequate.

The Court Case

With the inevitable changes in the city government and city officials, former action by those in authority in time came to

be questioned, finally leading to court action in 1930.

In court the city sought to oust the Pacific States Lumber Company and its logging operations from city land and timber, in the upper watershed (Cedar Lake Basin) with a heavy penalty for damage already done to the water utility. The case was based on the contention that the City Council exceeded its authority in entering into the contract of November 1917 conveying timber and rights of occupancy to the defendant, since the transaction was not referred to the voters for approval.

The statute invoked in the case was passed in 1917 shortly before the date of the contract and provided in part that any city or town in the state could dispose of a utility or any part thereof under specific procedure including bids, and that of referendum to the voters, a majority vote being required for approval. The 1930 complaint alleged the forest growth on the city lands to be an integral part of the water system and necessary to conserve the purity, quantity and quality of the water supply. (At the time of the trial there remained to be cut under the contract between 2,500 and 2,900 acres of mature timber). Thus under the complaint the relation of forest cover to water supply was the important issue. To substantiate its claim the city attempted to demonstrate in court that the timber cover was not only beneficial but an indispensable part of the water utility.

In reply to the complaint the lumber company contended in part that:

1. The standing timber was not inherently an integral part of the water utility and that the removal of the timber cover or the operation incident to its removal did not result in contamination by pollution or otherwise injure the water supply.

2. That the city through its officials, and performance had not included the timber as an integral part of the water utility.

3. That the council acted within its authority in entering into the contract of 1917.

4. That the city was estopped by its own acts in asserting the invalidity of the 1917 contract, operations having been carried on and large investments made under it by the defendant over a period of thirteen years and in addition the city had accepted substantial financial benefits.

The first skirmish in court was to the advantage of the defendant. The city pleaded to have the case tried before a jury in a King County (of which Seattle is the county seat) court. This was overruled by the local judge and the defendant won its motion to present the case before a judge, without jury, outside of Seattle, to avoid the influence of local prejudice.

Upon agreement of the contestants the trial was held before Judge Arthur McGuire of the Superior Court at Ellensburg. Washington. The trial, which occupied the greater part of two months, obviously entailed a very large cost since both sides made elaborate preparations and employed many expert witnesses, as well as high-priced legal talent.

In addition to its own employees, local sanitary experts, lumbermen and engineers, the city secured the services of such widely-known authorities as Dr. Trevor Kincaid, chairman of the Department of Zoology at the University of Washington, R. H. Ober, consulting engineer of Seattle, and Dr. Raphael Zon of the United States Forest Service. (The latter did not officially represent the Forest Service.) Outstanding among the lumber company's many witnesses on the subject of forests and water were R. G. Tyler, Dean of the Engineering Department of the University of Washington, David T. Mason, Forest

Engineer, and W. C. Morse, consulting engineer and formerly city engineer.

Of particular interest in this case was the appearance for the defense of Oliver T. Ericson, president of the City Council and a member of the council continuously since 1911 (except for the year 1924), and the present city engineer, R. H. Thompson, who played an important role in the early development and management of the watershed, having served in his present position at different times for many years.

It may be said that in the court hearing there was no charge of fraud in connection with the timber contract, nor was there complaint in regard to the company's performance under it, including such important points as sanitation and fire control measures; in fact, there is every evidence of satisfactory compliance. For a number of years the local logging operation has been outstanding in the matter of efficient fire protection.

Effect of the Original Forest Cover on Available Water and Rate of Run-off

Of all the phases of forest influences in relation to water supply, that of the effect of forest cover on quantity of water and rate of run-off was the important issue of the case, consequently the deliberations on it were outstanding in the court proceedings.

City testimony emphatically critized the clear cutting methods which have been universally employed in all logging operations within the entire drainage of the utility. While there was no definite practicable system presented as a substitute, the desirable objective pointed to was a slower rate of cutting under selection by trees, groups or blocks so as to cause the smallest possible disturbance to the forest canopy.

Although both sides presented lengthy testimony, together with a great mass of data on run-off from the watershed, the showing could hardly be considered as a substantial scientific contribution on the subject. The city presented expert testimony on the theory of the influence of forests on water based on observations made elsewhere, both in the United States and abroad.

The relation of the several factors affecting the disposition of precipitation, including crown interception, evaporation from crowns, and forest floor, transpiration, were vividly traced with estimates as to the approximate proportions. Relatively, the water supply here like elsewhere in this region (Pacific slope of the Cascades) is abundant. The Weather Bureau records submitted showed that at the station 2 miles below the lake (at practically the same altitude) the mean precipitation for the 25-year period, September 1, 1905 to September 1, 1930, was 105.8 inches, that for the 12-year period, 1906 to 1917, inclusive, up to the time of the beginning of logging by the defendant in the upper watershed, was 107.26 inches, and 103.7 inches for the 13-year period 1918-1930, during which cutting has been in progress. This indicates a decline in precipitation which is in accord with the general climatic trend in this region for the past 20 years, the most recent years being exceptionally deficient in moisture. The complainant contended that the forest below 3,000 feet was of greatest protective value since precipitation was greatest in this zone, that snow was slower to melt under forest cover than in the open and that the cutting of the commercial timber which extends about up to the 3,000-foot level, the point of maximum snowfall, was detrimental to water retention. (The area below the 3,000-foot level in the upper watershed is about 23,000 acres or two-fifths of the total area. The total cut-over area in November 1930 was about 7,000 acres. The area cut over annually amounted

to about 500 acres.) It was claimed that the forest floor was detrimentally affected by logging operations and subsequent burning of the slash.

The defendant answered by emphasizing that the prevalently porous character of the soil in the watershed permitted of great absorptive qualities regardless of the cover and that if the forest cover did influence the rate of run-off the effect here was very small since there is but little precipitation in the summer, the greater proportion of the heavy local rainfall occurring in the cooler, cloudy months when losses through evaporation take place slowly. The defendant also cited the importance of the large forest area above 3,000 feet, the approximate upper limit of present commercial timber, a factor in the water supply. This portion (above 3,000 feet) constitutes nearly three-fifths of the upper watershed area and is obviously of importance, since it embraces the source of the main feeder streams and conserves most snow for mid-summer run-off.

Precipitation

Certain city witnesses voiced the opinion that the influence of the original forest cover on precipitation, was here perceptible, one witness estimating that the added precipitation over a large forested area would be over 10 per cent more than after deforestation took place. The defendant submitted certain facts on this point which are very interesting even though there is room for doubt as to conclusions drawn. In this connection, the precipitation records at the Weather Bureau station and North Head on the Pacific Ocean at the mouth of the Columbia River, were compared with the 25-year record at Cedar Lake. Most of the precipitation in the Cedar River watershed as well as the greater part of the region comes with westerly winds off from the ocean. North Head lies roughly in the path of storms passing inland from the ocean and carrying on over the watershed. The intervening territory embraces very extensive areas of cut-over lands in the Willapa Harbor, Grays Harbor, and South Puget Sound districts. The graphs on precipitation at the two points showed month by month a marked similarity in proportion. It was less during the later periods at both points, but the percentage of decline, which as stated has been general, was less at the lake than at the ocean station. From this the defendant concluded that the existence or lack of existence of forests has had no effect on quantity.

In regard to the trend of variability of precipitation in relation to topography and altitude, it was pointed out that the annual precipitation at the intake in the foothills only about 13 miles below the lake was only about one-half of that at the lake.

Perhaps the outstanding testimony of the trial centered around the 25-year record of stream flow at the Crib Dam (lake outlet) and precipitation at a point about 2 miles below at the masonry dam. The city representatives divided the 25-year period, September 1905 to September 1930, into two periods with the division point at September 1917, the first period of 12 year representing conditions before logging and the second period 13 years (September 1917 to September 1930) representing the time under which logging had progressed at an average annual rate of about 500 acres. A number of diagrams and graphs were prepared from the measurements to show the change in amount and regularity of run-off of the second period in comparison to the first.

Table 1 giving figures on run-off and precipitation and embracing the essential basic data used in the above presentation was taken from the city records.

These figures show an increase of over 57,000 acres feet in the mean annual run-off for the period after logging began as

compared to the period preceding. It is obvious that the rate of cutting and total accumulated cut-over area (amounting to about 6,400 acres) could not be the sole contributing cause to such a large increase in run-off. Precipitation had actually declined. The factor which most likely accounted for the greater part of the increase was that of reduced seepage, due to a gradual sealing of the reservoir. This point was not introduced in the presentation of the case for certain reasons (presumably because the amount of seepage could not within reason be accurately measured) until in rebuttal by the complainant. The city's motion to reopen its case to include seepage evidence was denied by the judge.

Deductions made by both sides from the measurements presented were largely in accord with the facts yet they were not conclusive since no allowance was made for seepage. The city attorneys contended that the measurements clearly indicated a changed rate of run-off for the second period in that on June 1, 88 per cent of the measured run-off for the climatic year beginning with September 1 had taken place, leaving but 12 per cent for June, July, and August the months of light precipitation, while on June 1 during the 12 years preceding, there was a run-off of only 83.68 per cent, showing an increase of 4.32 per cent for the second period.

The defendant pointed out that the city measurements actually showed a greater run-off during the second period for the driest months, July and August, and that regardless of any variations in run-off that might exist, there was an abundance of water available with the storage facilities at hand to meet the probable needs of the city for many years. The statement that the present watershed was capable of supplying a population of over one million people (over two times the population of Seattle) was not refuted.

Regardless of the deficiencies in the data presented both sides in the trial agreed with the theory that deforestation had increased the quantity of water available for run-off. Opinionative evidence submitted by experts indicated that the increase under local conditions might be as much as 100 per cent. City testimony indicated that following a storm the flood

TABLE 1

MONTHLY MEAN RUN-OFF AND PRECIPITATION IN ACRE FEET. COMPARISON FOR THE TWO PERIODS SEPT. 1905 TO SEPT. 1917 AND SEPT. 1917 TO SEPT. 1930

Month	Run-off thousands of acre feet		Precipitation thousands of acre feet		Per cent run-off	
	First period	Second period	First period	Second period	First period	Second period
January	23,300	41,900	56,337	62,214	41.5	67.0
February	22,100	26,700	45,110	42,962	49.0	64.5
March	23,800	24,300	40,814	45,799	58.4	53.0
April	25,500	30,700	32,019	32,546	79.7	94.5
May	31,300	41,200	27,885	26,263	112.0	156.0
June	27,500	25,300	24,034	13,091	114.0	193.0
July	11,200	6,900	7,660	4,661	146.0	148.0
August	1,400	3,300	7,701	12,686	18.2	26.4
September	3,100	5,800	23,953	20,711	13.0	28.0
October	13,200	17,200	42,232	42,313	31.3	40.0
November	40,900	25,900	73,238	45,272	56.0	57.0
December	20,800	51,700	54,229	69,225	38.4	75.0

Mean annual run-off 1st period	244,300 acre feet
Mean annual run-off 2d period	301,582 acre feet
Mean annual precipitation 25-year period	105.8 inches
1st period	107.26 inches
2d period	103.7 inches

peak at the lake outlet was reached in about 18 hours in late years as compared to 36 hours before the surrounding forest was disturbed.

Erosion

The city claimed erosion to be a factor of significance on lands within the watershed immediately after cutting and gave testimony in regard to it. Defense testimony showed that due to the porous soil formation there was no natural tendency for detrimental erosion, and such erosion as did occur was temporary, due to the prompt and luxuriant growth of perennials and shrubs that follows cutting. The court concluded that the evidence indicated only a negligible amount of erosion.

Quality of Water

Of all the factors affecting the quality of the water, it is significant to observe that an area of about 1,600 acres of the drainage immediately around the natural lake shore now partly covered in various water stages was logged by the city preceding the defendant's operations. In addition, it is understood that the purity of the water at the intake before chlorination is influenced to a certain degree by conditions existing in the lower watershed which part of the utility was not primarily involved in the suit. Several sources of contamination and foul growth exist there which have attracted special attention with resulting remedial action.

In the evidence introduced to show the effect of logging on the quality of the water in the lake it was contended that the taste as well as the original clear sparkling qualities of the water were being seriously affected because of increased turbidity and the development of conditions more favorable to the growth of algae and microscopic organisms.

In the matter of turbidity, the evidence indicated that the greatest disturbance occurred during the earlier stages of cutting, particularly while operations were close to the shore and the lake was being used somewhat for the storage and transportation of logs. Operations are now over one mile from the lake and gradually moving farther away from it so that the disturbance, which is confined to the streams, is not only occasional but relatively small. The court concluded that the greater part of any increased sedimentation that may exist is corrected in the settling process in the streams and lake.

Testimony was introduced to show that the deforestation taking place tends to increase water temperatures, thereby favoring the growth of algae and other unfavorable forms of plant life as well as bacteria and other microscopic life. Studies made by Dr. Kincaid indicated that the lake was beginning to show growth of organisms (common in reservoirs) that are precursory to a bad condition. Such organisms, however, are not now present in dangerous quantities. It was brought out that at the intake (13 miles below the lake) during late years the temperature of the water had increased 2.8 per cent in relation to the temperature of the atmosphere. The court concluded that the city's contention was true to a certain degree, but that the resulting condition in this case did not amount to a substantial injury to the water supply.

A further bit of testimony introduced bearing on the subject of purity and quality of water, pointed to the benefits of the forest as a purifier of the air above it and the undisturbed forest floor as an important aid in clarifying a water supply, both bacterially and biologically. This contention was refuted in part by testimony indicating that harmful bacteria did not exist in the air over the forest, also that practically all effective filtering is accomplished by the porous soil.

Pollution

Even though logging operations had been in progress within the lake basin for 13 years, there being from 100 to over 200 human beings living and working during the greater part of each year within from one to two miles of the lake, there was no evidence submitted showing pollution in the lake. To the contrary, the existing state of purity was shown to be many degrees above the scientific standard. It is apparent, therefore, that the water as it passes from the lake basin or upper watershed in naturally pure and suitable for domestic use without chlorination.

Decision of Court

The decision of the Court was in favor of the defendant, The conclusions of the Judge on the more important points involved being interpreted as follows:

1. The forest is beneficial but is not a necessary or an integral part of the water system in this case.

2. So far as the evidence shows there has been no contamination of the water actually rising from the logging operations of the defendant.

3. That in regard to color, temperature taste of water and the rate of run-off, the forest is an influence only to a certain degree and the removal of the forest cover in this case under the methods now in use or a modification thereof, with proper sanitation measures, is not detrimental to the water utility.

4. That the city is prevented by equitable estoppel from voiding its contract with the defendant and removing the operations from city lands.

The city has appealed the case to the State Supreme Court, decision of which has not as yet been made.[1]

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[1]Since this was written word has been received that the Supreme Court has rendered a decision upholding the Superior Court. It is understood now that the Seattle legal department intends to fight the case further by petitioning the Supreme Court for a re-hearing on the premise that the court in rendering its decision apparently side-stepped the factor of forest influence. The case is referred to as "City of Seattle vs. Pacific States Lumber Co." Superior Court No. 8162, Kittitas County, Wash.; State Supreme Court No. 23367. *Ed.*

FOREST MANAGEMENT ON THE DELAWARE & HUDSON ADIRONDACK FOREST[1]

By E. A. STERLING

New York City

The extensive utilization and planting operations, fostered by the Delaware and Hudson Company in the Adirondack Mountain region since 1903, represents one of the largest forest management projects of its kind. It resulted from early forestry publicity, under plans made and directed by foresters. The author shows what a commercial organization can accomplish in the face of many difficulties and gives an interesting bit of early history of timber utilization in an old region. Mr. Sterling also finds serious doubts by the owners as to whether the project will pay; yet, herein lies the business foundation of forestry.

NO SECTION of northern New York invokes more historical reminiscences than the Lake Champlain Valley and its Chazy-Chateaugay extension. In ancient times a hunting ground of the Iroquois, it has been known to whitemen for more than 300 years. The background of the early soldiers, fur traders and colonists has gradually merged into the past until the details are lost, but in this brief story of a notable forest operation there is also a faint picture of how later people lived and made a living, largely from the forests and other natural resources.

Beginning with Champlain in 1609, many famous characters of our school books lived and fought to lay the foundation for the Empire State. Burgoyne, William Johnson, Ethan Allen, Benedict Arnold are just a few of the many who have enriched the pages of recorded history. After the war of 1912 public records are dim but the plans, hopes and activities of later generations form the more recent history of the region and of its local enterprises.

The pioneers who first settled in the mountainous section northwest of the blue-green Champlain Valley at the beginning of the nineteenth century, early established grist mills, saw mills and small iron forges. That the saw mills were small or short lived is attested by the fact that one hundred years ago little inroad had been made on the standing timber, and it is known that the early lumbering was confined to areas in and around settled communities, where easily available white pine was cut. In 1820 the Adirondacks proper were too remote for lumbering, and even until 1860 virgin forests of pine spruce and hardwoods covered most of the land.

Interlocked with the earliest records of lumbering in Clinton and Franklin counties is a history of early American iron making. The first iron forges were worked only intermittently and to supply local needs, as transportation facilities were lacking, but as with the original saw mills, they were the forerunners of large scale exploitation during the 80's and 90's. After the opening of the Ogdensburg and Lake Champlain Railroad a forge of considerable size was built at the outlet of Lower Chateaugay Lake, and the extensive mining of iron ore was started to supply this and other forges on the Saranac River and elsewhere in this section. These in turn created a use for the large timber supply.

[1]This article was prepared at the personal request of Mr. L. F. Loree, President of the Delaware & Hudson Company. The material has been gleaned largely from the records and data supplied through the courtesy of company officials. Mr. R. R. Hope summarized much of the information and so functioned as co-author.

Charcoal was then necessary for smelting, and the cutting of wood for its production continued for over three decades as one of the major local industries. Cordwood was first cut on lands around the furnaces, but later came from wherever an easily available supply could be found. With the increased industry names became associated with local iron and forest lands, and desirable holdings of ore and charcoal wood were gradually unified. Prominent among the first organizers were Smith M. Weed and Andrew Williams, who in 1873 formed the Chateaugay Iron Ore Company. Their first forges were at Clayburg and Russia, N. Y., but they later concentrated on the Lyon Mountain iron body, from which ore was teamed and trucked to the large Catalan Forge on Lower Chateaugay Lake. In 1881 the Chateaugay Ore and Iron Company assumed direction of the Lyon Mountain mines, increased the output and built a modern iron furnace at Standish, N. Y.

The charcoal kilns, first of the open pit and later of the beehive type, were built in the forest around the forge at Chateaugay Lake, but later with the extension of the Plattsburg-Lyon Mountain Railroad to Lake Placid, kilns of large capacity lined the tracks up to Loon Lake. Timberland was purchased to supply wood, and in time almost 100,000 acres had been acquired. No records exist to tell us definitely the amount of wood converted into charcoal, but 101 kilns with a yearly capacity of 1,000 cords each were burned at one time, and it is known that for thirty years the Chateaugay Company made iron with charcoal produced from its forest acreage. It is estimated that over 1,500,000 cords, or roughly 150,000,000 cubic feet of wood, were used for this purpose!

In addition, in June, 1896, a contract was made to furnish 15,000 cords of spruce and fir pulpwood yearly to the Glens Falls Paper Mill Co., later taken over by the International Paper Company. From 1896 until the final merchantable pulpwood operation in 1915, almost 300,000 cords or 30,000,000 cubic feet in addition to charcoal was harvested from company lands. Other demands on the forest were made by large saw mills at the outlet of Lower Chateaugay Lake and at Bradley Pond, which furnished lumber to erect homes and buildings for the iron mining towns.

In 1903, shortly after acquiring the Plattsburg-Lake Placid Railroad, the Delaware and Hudson Company also purchased control of the Chateaugay Ore and Iron Company to stimulate production of iron at Lyon Mountain and increase freight revenues. About the same time, coke was introduced to replace charcoal in the iron furnaces and the railroad company was left with a large area of mostly cut-over timberland for which it had no direct use. Some of the officers had heard of "forestry," so information was sought from the original U. S. Bureau of Forestry.

First Forestry Steps Taken in 1904

In 1904, Thomas H. Sherrard of the United States Bureau of Forestry made a preliminary survey of the C. O. & I. Adirondack timberlands, and it is interesting to note how closely his report approximates one which might have been written on a similar property by a forester today. Sherrard's first step, that of land classification, recorded the extensive lumbering of the past, and showed the following types: Virgin spruce and hardwoods, 18,000 acres; virgin hardwoods with some spruce, 17,000 acres; virgin hardwoods without spruce, 10,000 acres; second growth hardwoods ready for cutting, 23,000 acres; and denuded or brush lands, 28,000 acres. Agricultural and mining lands unsuited for forest growth were not included.

The Forestry Bureau recommended a reforestation program for the denuded lands, and suggested a plan for lumbering the remaining merchantable wood with a view to obtaining revenue while leaving the forest in a condition to promote tree growth and increase the forest capital. The owners adopted this long-time viewpoint of a planting program while obtaining an income from the merchantable forest products available.

It is interesting that this private forestry enterprise started only two years after the first direct step in the reforestation of Adirondack lands was taken by the State of New York, and independently of each other. Small forest plantations were made by the old Cornell College of Forestry at Axton, N. Y., as early as 1899, but not until 1902 was the first large state plantation started by the late Col. William F. Fox, then head of the old Forest, Fish and Game Commission. About 420,000 trees, packed and shipped by wagon under the direction of the writer from the Cornell demonstration forest nursery, at Wabeek, were planted at Lake Clear Junction under the direction of Mr. Knechtel. Incidentally, the white pine seedlings at Wabeek were grown from seed produced from the planted white pine near Frankfort, Germany. Many seedlings were also imported in the large willow baskets later used for transporting transplants to the planting site in the Adirondacks. The next year (1903) a nursery was started at Saranac Inn station. Thus large-scale private and state forestry came into existence in New York.

In September, 1904, presumably because of a forest fire which a year previous had burned over three-fourths of the company timberlands, and also to increase tonnage on the Chateaugay Branch Railroad, a contract was made with the Dock and Coal Company of Plattsburg to sell all the remaining merchantable hardwoods and the softwoods not being shipped as pulpwood to the Glens Falls Company. Lumbering was to be handled by the Dock and Coal Company with payments arranged on a stumpage basis, and this company also undertook to cut the spruce and balsam previously contracted on pulpwood sales. Owing to the lack at that time of effective measures of control recurring forest fires did much damage to the forest.

A study of these forest fires indicates that the two chief causes were logging and locomotives sparks. Most severe in 1903, 1908, 1911 and 1915, fires destroyed much merchantable timber and damaged the humus and other soil cover so necessary in establishing and maintaining a new timber growth. The Dock Company continued salvage cuttings on the burned areas and on lands not burned until 1918, when the old growth timber was exhausted and operations ceased. There remained only scattered areas of cull hardwoods previously logged over and stands of undersized swamp spruce and fir in scattered wet areas which had escaped hard burning. Under these conditions, planting was the only feasible method of establishing a desirable new growth on extensive areas.

Nursery and Planting Operations

The first forest nursery was established in 1906 at Wolf Pond, where production of white and Scotch pine, Norway spruce and European larch was undertaken. Since no one in this country twenty-five years ago was thoroughly experienced in nursery work, the number of seedlings successfully raised was limited. Trials with various species were made and in addition to the native trees of the Adirondacks it was thought that European species such as Scotch pine, which had been successfully planted by foresters in Germany and Russia, might likewise be successfully

grown. In the nursery "damping off" gave serious trouble, not only at Wolf Pond but in all the state nurseries, and it was many years before the late State Forester Pettis found effective measures of control.

The small Wolf Pond nursery of about three acres, was abandoned after field planting operations in 1915, and full attention was given to a second nursery which had been started in 1910 at Bluff Point, near Plattsburg. Frost leaves the ground about two weeks earlier around Lake Champlain, which has an elevation of about 100 feet above sea level, than at Wolf Pond with 1,500 feet elevation, and in other ways the new site was found more satisfactory. White and Scotch pine continued as the standard stock, although such species as white cedar, white ash, Norway spruce and black locust were grown to some extent. The aim at Bluff Point was to provide 1,000,000 seedlings yearly, or enough trees to reforest 1,000 acres, but many difficulties developed in meeting the requirements.

In 1915, the white pine at the nursery became infected with blister rust, thus making necessary in 1917 the complete destruction of all this species. To replace the white pine an attempt was made to raise the native red pine, but the seed was difficult to obtain, so Scotch pine, white and Norway spruce were mainly planted. Among the many experimental plantings were Douglas fir, Austrian pine, western yellow pine, white willow, Norway poplar, Engelmann spruce, concolor fir, white ash, European larch, dwarf mountain pine, balsam fir and Colorado blue spruce.

The original planting of company nursery stock was in 1908, when 18,000 Scotch pine trees were set out at Wolf Pond. Yearly thereafter except 1909, 1911 and 1919, until 1927, when all available areas were covered, recorded plantings were made. In 1913, when reforestation was well started, it was estimated there were 50,900 acres of burned and denuded lands to be planted. Natural changes in the forest cover converted about 38,400 acres of this original area to brush land unsuitable for planting, so upon completion of the 1927 program about 12,500 acres had been artificially restocked with a recorded number of 14,764,846 trees.

The condition of the plantations is typical of those of similar age and character elsewhere in the Adirondacks. A large percentage of the trees are now less than twenty years old so the problems of thinning, pruning and utilization are still to be met. The experimental work of the state, in older plantations as at Wabeek and elsewhere, should give valuable information, but the basic questions of composition, density, commercial yield and other problems remain uncertain or unsolved.

Forest Inventories and Protection

At various periods since Sherrard's preliminary examination of forest conditions estimates were made of the remaining stands of scattered timber. In 1918, for instance, 19,952 acres were reported more or less timbered, with 136,000,000 feet of mostly poor quality hardwood; 8,000 cords of poplar; and about 14,000,000 feet of softwoods—7,000,000 feet of which were considered available. In 1920 and 1921, crews from the Cornell forestry school went over the entire woodland holdings of the company, at this date increased to 120,684 acres, and obtained field data for the preparation of a twenty-year forest working plan. Previous boundary surveys and topographical maps had been made and used in the forest survey.

Professor S. N. Spring made a study of silvicultural conditions and laid out permanent sample plots on every recognized forest type. Growth studies were in charge of Professor Bentley, who obtained

lata for computing stands, growth and olume tables. Mr. Guise conducted a imber survey, running a ten per cent trip tally in well-timbered areas and quarter mile sample plot lines on less aluable types. The 1921 report indicated 37,724 acres, including reforested and natural sprout growth land, did not have and would not support any merchantable timber within twenty years; and that some revenue could be expected from about 32,960 acres. Of the latter, 22,749 acres were covered with poplar which should be large enough for harvesting in 1937.

From the standpoint of general conservation and particularly forest fire protection, Chateaugay's forest is advantageously located. Being adjacent to the old "blue line" and partly within the recently extended state park boundary, public agencies provide efficient patrol and suppression facilities. A state observation tower near the boundary permits of immediate detection and telephone connections enable the wardens to summon organized fire fighting units with good equipment. The state service has been supplemented by a company force, so that in the last few years, the results from protection have been satisfactory. Fish and game are plentiful, but hunters and fishermen have not been encouraged on company lands, because it has been found they add to the fire risk. Trespassing has not been strictly forbidden, but the primary aim has been to grow trees rather than to provide recreational facilities for the public.

At times, the company forester, Mr. H. D. Bristol, tried experiments to increase timberland revenues, which are so necessary in carrying through a long-time forest management plan. Among these miscellaneous ventures were muskrat farming, filbert nut culture, and recreational developments. None of them, however, was financially successful, and at present the chief hope for future profit rests on the annual wood increment. It is doubtful whether the "residual" forest and natural regrowth will yield much net return. This in turn means that further thought and attention must be given to full utilization of the new timber when it has matured. Perhaps charcoal will again come in favor. New methods of burning iron ore with wood while simultaneously salvaging wood distillation by-products, are being developed, and some refinement of this process may again bring about a new industrial center at Standish.

Land Holdings and Related Activities

Acquisitions of land continued until about 1928, so as it now stands, the Chateaugay property comprises about 150,000 acres. Situated on the north and east slopes of the Adirondacks, the drainage is north, northeast and east. There are three large lakes—Upper and Lower Chateaugay and Chazy—and numerous small lakes and ponds. The topography is mountainous, and the soil a thin sandy loam, originally covered with almost a foot of humus.

Supplementing the forestry activities of the Chateaugay Ore and Iron Company, since 1911 reforestation has been carried on directly by The Delaware and Hudson Railroad. Up to 1917 almost a million trees were set out on railroad property, and some of the older "living snow fences" planted along the rights-of-way are now both decorative and protective. Interest in forestry work was renewed in 1926 by the company's Industrial Development Department, which conducted yearly demonstration plantings by officials of the railroad on inspection trips. Stock for these demonstrations, usually pine or spruce, was provided by the State Conservation Commission. In 1929 approximately 175,000 trees from private nursery stock were planted on northern railroad lands, both along the right of way for

snow fences and on waste lands. The total planting by the railroad engineering and maintenance forces has been 1,072,000 trees. In 1930, Mr. G. Victor Schwarz, a trained forester, was employed to carry on the general forestry activities such as replacement planting, thinnings, inventories and related service.

The Hudson Coal Company, another affiliate of the "D. & H.," has in the past experimented with forestry in its Wyoming, Pottsville and Schuylkill fields in Pennsylvania. One hundred thousand or so red oak seedlings were planted, but due to high costs, exposed sites and uncontrolled grazing the results were not encouraging.

This about brings up to date the history of the forestry enterprise fostered by the Delaware and Hudson Company. It is one of the largest private forest operations, from utilization to constructive management, carried out along the general lines recommended by orthodox foresters. In keeping large areas of non-agricultural lands productive and in overcoming the difficulties to this end, it serves as an excellent example to other land owners. There is also the benefit accruing to the region and the community from the permanent use of such land.

The economic side is another story with the same old questions and doubts as to whether private owners can earn a fair return on such an investment. The fixed charges of interest and taxes can be computed but the value of the material from a planted forest and the time when it will reach commercial maturity are unknown. There will have to be much higher values for the new wood being grown if its production is to prove good business. This in turn brings up the whole subject of future markets for wood products and the comparative costs of production in the south where growth is much more rapid. At the same time, it leaves out the recreation, protection and "looks" values which apply to public forests.

Thirty years—or fifty years—hence, will there be an ample market for all forest products, including the low grade timber down to the basic cellulose? The volume of this class of material now and indefinitely is far beyond any evident demand, but upon its utilization depends in large part the economic return and the industrial future of private forestry.

Generally, private capital is a better judge of the profitableness of any development, and a much better administrator than the government ever will be. Only when important national interests are involved which private capital cannot or will not serve, should the government invade this field.

ARTHUR M. HYDE, *Secretary of Agriculture.*

COMPARATIVE TIMBER-YIELDS

By I. T. HAIG

Associate Silviculturist, Northern Rocky Mountain Forest Experiment Station

The author has made an interesting comparison of the rates of growth of a number of important American timber trees. The study indicates the richness of our native tree flora in fast-growing conifers, and that these are not confined to any one region or type of climate.

DURING THE LAST decade the U. S. Forest Service and several of the forest schools have completed rather comprehensive studies of the growth and yield of a number of commercially important native conifers. As the majority of these studies show the volumes obtainable in fully-stocked stands to very similar standards of utilization, they furnish an excellent opportunity to compare the relative rates of growth on a number of important tree species. This is always an interesting subject to many foresters, as indicated by the Woodward-Forbes controversy[1] of some months ago, and consequently the writer has felt it worth while to bring some of the newer data together for purposes of comparison.

In this comparison only normal yield tables, showing the volumes obtainable in fully-stocked stands, have been used throughout. In each instance the cubic-foot volumes include the entire peeled contents of the tree; i. e., stump, stem and tip, but not bark or branches. The board-foot values are, with two exceptions, in the International 1/8-inch rule and show the contents of all trees 7 or 8 inches and up scaled to a 5-inch top diameter. Both exceptions are to reasonably comparable standards. In each case an attempt has been made to choose values for average site, but, as this is not always readily determined from tabular descriptions, minor injustices may have been done individual species. Within these limitations Table 1 gives a fair comparison of the relative rates of growth and yield for a round dozen commercially-important conifers.

Even a casual survey of the timber-yields shown in Table 1 reveals two very interesting features: (1) The richness of our native flora in fast-growing conifers, even in a list by no means complete, for of the species for which data are given six produce gross yields in excess of 20,000 board feet at 40 years and six over 50,000 board feet per acre at 100 years. (2) The fact that valuable fast-growing species are not confined to any one region or type of climate. For example, both the South and the Pacific Coast, with a wide diversity of climate and soils, are represented among the leaders, and white pine (including both *P. strobus* and *P. monticola*) more than holds its own in three widely separated forest regions.

Total timber-yields, the factor emphasized in Table 1, is, however, a rather unsatisfactory measure with which to compare rates of growth, for the numerical rank of species derived in this way varies markedly with the age chosen, and no one age is equally fair to all species alike. For this reason perhaps the best single measure of the wood-producing capacity of a species is maximum average annual growth, a value independent of all elements of personal choice. Table 2 shows in descending order the relative rank of the conifers listed on this basis.

[1] Journal of Forestry, Vol. 26, pp. 5-11 and 500-506. 1928.

In this table a species growing in two distinct forest regions is given separately by regions.

Under this rating, Redwood (*Sequoia sempervirens*) is preeminently the fastest growing native conifer, far surpassing its nearest rival, Douglas fir (*Pseudotsuga taxifolia*), a species that in itself maintains an extraordinarily high rate of growth. These two species head the list on the basis of both cubic-foot and board-foot production, and it is doubtful if any native conifer not yet accounted for will be able to displace them. Slash pine (*Pinus caribea*) and white pine (*Pinus strobus* in New England take the fourth and fifth places in cubic volume production, while white pine in New England and western white pine (*Pinus monticola*) in the Northern Rocky Mountains capture, respectively, similar places from the standpoint of board-foot yields. Four regions and as many types of climate are represented among the first five species listed and five widely diverse regions among the same number of tail-enders. The latter group includes, on the basis of board-foot yields, shortleaf pine (*Pinus echinata*) from the South, ponderosa pine (*Pinus ponderosa*) from both the Northern Rocky Mountain and California regions, red spruce (*Picea rubra*) from New England, and jack pine (*Pinus banksiana*) from the Lake States. The inclusion of other species not listed would, of course, undoubtedly change the general position of some of the species just named.

Relative wood-producing power alone, as expressed in maximum average annual growth, is not, however, a complete expression of the value of tree species as timber producers, as the length of time needed to reach merchantable size is also an important factor. Some species, such as the southern pines, tend to attain merchantable size in short order, whereas such species as the western yellow pine and western white pine tend to reach merchantable size rather slowly. The larger yields finally obtained in some cases by

TABLE 1

RATE OF GROWTH AND YIELD OF TWELVE COMMERCIALLY-IMPORTANT CONIFERS

Region	Tree species	Average site or site index	Maximum average annual growth		Theoretical rotation age[1] for		Total yield										Reference
							At rotation age		At 40 years		At 60 years		At 80 years		At 100 years		
			Cubic feet	Board feet	cubic feet	board feet	Cubic feet	Board feet	Cubic feet	Board feet	Cubic feet	Board feet	Cubic feet	Board feet	Cubic feet	Board feet	
					Years												
South	Loblolly Pine	90	131	750	35	50	4600	37500	5200	28500	6700	43000	7400	50000	......	......	U. S. D. A. Misc. Pub. 50
South	Longleaf Pine	80	101	573	50	75	5050	43000	4000	17000	5950	33500	7350	45500	8300	54000	U. S. D. A. Misc. Pub. 50
South	Shortleaf Pine	70	110	558	40	60	4380	33500	4380	17800	6000	33500	6930	42000	7520	47800	U. S. D. A. Misc. Pub. 50
South	Slash Pine	80	143	567	15	45	2150	25500	4600	22000	5750	32000	......	......	......	......	U. S. D. A. Misc. Pub. 50
New England	White Pine	I	136	828	45	60	6120	49700	5390	27800	7980	49700	......	......	......	......	Harvard Forest Bul. 7
New England	Red Spruce	50	80	310	65	80	5200	24800	1860	1200	4780	13300	6060	24800	6520	28800	U. S. D. A. Tech. Bul. 142
Lake States	White Pine	60	121	739	70	90	8470	66500	4200	10500	7200	36500	9500	59000	11100	72000	U. of Wis. Research Bul. 98
Lake States	Jack Pine	Medium	79	214	35	70	2750	15000	3100	3500	3750	11500	4100	16500	......	......	U. of Wis. Research Bul. 90
N. Rocky Mts.	Ponderosa Pine	Medium	59	298	40	110	2350	32740	2350	5400	3300	14610	3960	22960	4550	29760	U. of Ida., For. Exp. Sta. Bul. 1
N. Rocky Mts.	W. White Pine	60	118	760	100	120	11850	91150	2650	4450	5880	23250	9000	48750	11850	73500	Mimeograph Report, U. S. F. S.
Pacific N. W.	Douglas Fir	160	170	1190	70	80	11900	95200	6160	30500	10200	66200	13360	95200	15600	115100	U. S. D. A. Tech. Bul. 201
California	Douglas Fir	100	180	962	50	70	9000	67300	7200	31700	10500	56900	12750	76200	14300	91000	U. of California, Coll. of Agri., Bul. 491
California	White Fir	60	128	750	70	90	9000	67500	......	......	7400	36500	10000	60000	11500	74000	U. of California, Coll. of Agri., Bul. 407
California	Ponderosa Pine	III	66	350	120	130	7970	45000	......	......	......	......	2600	9300	5400	25700	Jour. Agr. Research 31: 1121-1135
California	Redwood	II	310	1930	45	55	13900	110000	12400	68000	17100	115000					U. of California, Coll. of Agri., Bul. 361

[1]Year of culmination of average annual growth.

the slower-growing species probably do not completely offset the longer time necessary to produce timber large enough to log. Accordingly, some weight should be given to this time factor. Table 3 shows in descending order the relative standing of the conifers listed based on the time needed to produce in fully-stocked stands an average tree 8 inches in diameter, breast high. This standard is arbitrarily chosen chiefly on the grounds that it seems reasonably fair to all species and that in stands with an average diameter of 8 inches about one-half the trees would be above this limit and hence merchantable under close standards of utilization.

Redwood again heads the list, proving itself the species par excellence, with some of the rapid-growing southern pines and Douglas fir making up the remainder of the five leading species. Loblolly (*Pinus taeda*) and slash pine are particularly fast in reaching merchantable size, with longleaf (*Pinus palustris*) close behind and white pine in New England a good rival. It is true that there are certain inconsistencies in the ratings shown in Table 3. White fir (*Abies concolor*), for example, is favored by the fact that only trees 4 inches and up, and not all trees, were used in computing average diameter; while western white pine is handicapped by the mixed nature of the stands in which it grows where many tolerant trees if small size lower the average diameter of the stand without appreciably affecting volume. But on the whole the comparison seems fairly reasonable.

Any ranking on rate of growth, therefore, should probably give due weight to both wood-producing capacity and the time needed to reach merchantable size.[2]

TABLE 2

RELATIVE WOOD-PRODUCING CAPACITY OF TWELVE COMMERCIALLY-IMPORTANT CONIFERS IN TERMS OF MAXIMUM AVERAGE ANNUAL GROWTH

Numerical rating	Maximum average annual growth Cubic feet	Numerical rating	Maximum average annual growth Board feet
1. Redwood	310	1. Redwood	1930
2. Douglas fir (Calif.)	180	2. Douglas fir (N. W.)	1190
3. Douglas fir (N. W.)	170	3. Douglas fir (Calif.)	962
4. Slash pine	143	4. White pine (N. E.)	828
5. White pine (N. E.)	136	5. Western white pine (N. Rocky)	760
6. Loblolly pine	131	6. Loblolly pine	750
7. White fir	128	7. White fir	750
8. White pine (Lake States)	121	8. White pine (Lake States)	739
9. Western white pine (N. Rocky)	118	9. Longleaf pine	573
10. Shortleaf pine	110	10. Slash pine	567
11. Longleaf pine	101	11. Shortleaf pine	558
12. Red spruce	80	12. Ponderosa pine (Calif.)	350
13. Jack pine	79	13. Red spruce	310
14. Ponderosa pine (Calif.)	66	14. Ponderosa pine (N. Rocky)	298
15. Ponderosa pine (N. Rocky)	59	15. Jack pine	214

[2]Had the data been available for each species, an even more interesting and valuable comparison would have been on the basis of grades produced, and, consequently, the dollar value of the product. It is quite probable that, on such a basis, the relative order of the species in the author's tables would be materially altered. *Ed.*

TABLE 3

RELATIVE RATE OF GROWTH BASED ON TIME NEEDED FOR AVERAGE TREE TO REACH 8 INCHES, BREAST HIGH

Numerical rating		Number years needed
1.	Redwood	22
2.	Loblolly pine	29
3.	Douglas fir (Calif.)	33
4.	Slash pine	36
5.	Douglas fir (N. W.)	37
6.	Longleaf pine	44
7.	White pine (N. E.)	45
8.	Shortleaf pine	48
9.	White fir	50
10.	White pine (Lake States)	53
11.	Ponderosa pine (N. Rocky)	55
12.	Ponderosa pine (Calif.)	65
13.	Jack pine	70
14.	Western white pine (N. Rocky)	78
15.	Red spruce	87

On this basis, redwood is undoubtedly the fastest-growing conifer, with Douglas fir and loblolly and slash pines close behind. These species, together with the northern and western white pines and white fir, form an exceptionally fast-growing group of conifers. It is interesting to note, as previously stated, that this group contains conifer types scattered from the Pacific Coast to New England and from the Lake States to the Gulf of Mexico.

How important are the mineral elements of the soil in regulating tree health and growth? Professor Pierre Delbert (Paris Letter, *Journal of the American Medical Assoc.*, Oct. 11, 1930, and Feb. 7, 1931) reports that in France, fertilizers are employed to restore phosphorus, calcium and potassium to the soil deprived of these substances by continued production of cultivated crops, but that this is seldom done for magnesium. He believes that the high incidence of cancer in parts of France is due to a deficiency of magnesium in the diet. Of 24 rural communes having the most cancer, 23 have no magnesium; of 25 districts with a very low cancer incidence, 24 have a soil high in magnesium content. Soil scientists have presented much evidence for and against the theory of a calcium-magnesium balance governing plant growth. The fact that magnesium is an essential constituent of chlorophyll should lead forest investigators to study the part played by magnesium in tree growth and health.

S. B. DETWILER, *U. S. Bureau of Plant Industry.*

THE BROWN-SPOT NEEDLE BLIGHT OF LONGLEAF PINE SEEDLINGS[1]

By PAUL V. SIGGERS[2]

Bureau of Plant Industry

The damaging effect of the brown-spot needle blight on various southern pine seedlings has been recognized for several years, but little factual data has been available. Mr. Siggers shows that the brown-spot needle disease is one of the most important of all the variables affecting the development of natural longleaf pine reproduction. Observations of sprayed and non-sprayed seedlings, show that spraying results in increasing the average diameter of the sprayed seedlings one and one-half times that of non-sprayed seedlings. His studies show also that although a single fire reduces the brown-spot needle blight for the season following the fire, by the end of the second season the influence of the fire on the disease has disappeared.

PART 1. INFLUENCE OF THE BROWN-SPOT NEEDLE BLIGHT ON THE DEVELOPMENT OF LONGLEAF SEEDLINGS

WITH THE DEVELOPMENT of forestry in the Gulf States, an important leaf disease of yellow pine seedlings has, in recent years, attracted much attention. While the disease occurs on most of the southern pines, this investigation has been confined to longleaf (*Pinus palustris*). This is because of the susceptibility of longleaf to the disease, its importance as a source of commercial timber and its ability to produce a crop of wood on relatively poor sites.

Although the disease which is caused by *Septoria acicola* (Thüm.) Sacc. has been known to occur on the foliage of large trees, it is common only on seedlings, and is apparently injurious to the foliage of seedlings where this is within eighteen inches of the ground. Only longleaf seedlings, a few inches high, are considered in this study. With the mild winter climate of the lower Gulf region, the disease develops on the needles throughout the year. Some of the best spore collections have been gathered in November and December. However, cold weather does retard the progress of the disease and its rate of development appears lowest during the winter.

Much of the field work has been restricted to an area of less than two acres containing a dense stand of longleaf reproduction. This is part of a larger area that was burned in September, 1920, and logged in the following November at the time of seed fall. The stand of longleaf that became established was remarkably dense. Counts of seedlings in small plots indicate densities varying from 39,000 to 342,000 to the acre. These seedlings are now ten years old and the great majority are

[1]Much assistance in this investigation was given by Mr. J. K. Johnson, Forester of the Great Southern Lumber Company, Bogalusa, La., with the experimental spraying in 1928. Only through the courtesy of officials of this Company has it been possible to initiate or continue these long-time tests. The writer is particularly indebted to Dr. Carl Hartley, under whose direction this work is being done, for suggesting methods employed in the investigation. To Mr. Philip C. Wakeley of the Southern Forest Experiment Station, thanks are due for starting experiments in 1928 and much assistance in the field during the following winter. Acknowledgment is due Mr. Roy A. Chapman of the Southern Forest Experiment Station, for aid with the statistical work. Much of the field work was done by Messrs. Clyde Christensen and L. D. Glenn.

[2]Associate Pathologist, Division of Forest Pathology, Bureau of Plant Industry, in coöperation with Southern Forest Experiment Station, New Orleans, La.

less than two inches high and increasing only slightly in height. It is common for longleaf to remain at ground height for three to five years. This period results in greatly increased foliage and diameter growth and the development of a strong root system. However, rosette habit for as long a period as ten years, over an extensive and well-stocked area, under fire protection is not a common occurrence. To determine why these plants are backward and to clarify certain controversial points has been the writer's main project since December, 1928.

Preliminary experiments suggested by the Bureau of Plant Industry were started in 1928 in coöperation with the Southern Forest Experiment Station. To obtain some information on the rôle that this defoliating disease plays in the slow development of seedlings, a number of plots were laid out in natural reproduction by Mr. Philip C. Wakeley of the Southern Forest Experiment Station in the spring of 1928 and sprayed during that growing season. This work demonstrated from the beginning that the disease can be controlled by fungicides and can therefore be controlled in nurseries, insuring clean planting stock whenever desired.

Factors Affecting Seedling Growth

The most important factors that determine whether a seedling will live in a normal manner or become stunted or finally die are disease, character of the ground cover, and seedling density with concomitant root competition. These are considered in the order listed. As fire and hogs have been excluded from the area studied, their influence on the pines is not considered in the first part of this paper. Other factors, as light, climate and some physical and biotic influences of the site are also disregarded, because it may be safely assumed that on this area their effect was essentially uniform. The subject of site is considered on a broad basis by Toumey (4)[3] and the writer is following his classification by considering the brown-spot needle blight as part of the biotic influence of the specific site.

Brown-Spot Needle Blight

PATHOGENICITY

Septoria acicola is found in constant association with the disease not only on isolated brown-spots but later on the dead needles. There is practically no doubt about the pathogenicity of the fungus although neither the organism nor the longleaf pine is readily adaptable to inoculation experiments conducted under laboratory conditions. Germination of the spores has been obtained by the writer by placing them in tap water in contact with fresh pine needle tissue. Subsequent growth of the fungus on agar is quite slow. To quote from a letter from Doctor Eugene C. Tims, Associate Plant Pathologist at the Louisiana State University: "I had the causal organism in pure culture on numerous occasions and obtained conidial production quite regular during 1925 and 1926. The conidia did not germinate, however, on any medium used except prune agar and prune decoction. I made a number of inoculations on young slash and longleaf pine seedlings which were successful. I sprayed the needles with an aqueous suspension of spores and then covered the needles with moist chambers for forty-eight hours. Small spots appeared on the needles about two weeks later. The fungus was successfully reisolated from such typical spots."

In a recent article, Hedgcock (2) has reviewed the literature on the disease and considered the pathogenicity, taxonomic position and range of the causal organism, topics beyond the scope of this paper.

[3]Numbers in parentheses refer to literature cited at the end of the paper.

DISEASE AND DEFOLIATION

In the spring, spores from lesions formed on the foliage of the previous growing season start infection on the young elongating needles. An isolated spot may originate at the needle tip or a short distance below, where it soon encircles the leaf in the form of a narrow brown band, usually not exceeding an eighth of an inch in length and always with definite margins. This last character is of diagnostic value, distinguishing the brown-spot from the leaf rusts, which form conspicuous lesions in the spring on needles of the previous year. The brown-spot needle blight is not a rust and this term should not be used to describe it.

A series of well-isolated brown-spots does not kill the green tissue above or below the lesions as the fungus apparently does not invade the vascular tissue. Among small seedlings, however, normal sequence of the disease involves infection of the green tissue between the original lesions. When these spots become numerous enough, they result in killing the small amount of green tissue remaining and this occurs apparently without direct fungus invasion. After a few weeks' exposure to this type of infection, the needle starts to die back from the tip.

The ordinary diseased needle, by the end of the summer, has three different areas, the dead tip, followed by a spotted zone alternating with green tissue, below which is an area of entirely sound, green tissue. The oldest leaves, that is, those longest exposed to infection, are the most injured. Sometimes these oldest infected needles are shed by late summer. As most plants with any degree of vigor produce new leaves well through the summer, varying degrees of leaf infection will be found on the same plant, depending on the age of the needles. When plants are severely attacked, premature defoliation occurs which must result in a reduction of photosynthetic activity.

NORMAL FOLIAGE RETENTION

Normal foliage retention covers the period that foliage of a given season remains green in the absence of defoliating influences such as disease, insects, or fire. Repeated observations on disease-free seedlings growing in fire-protected areas have shown that seedlings in the grass retain a given set of needles for a minimum period of seventeen months, counting April as the first month and including August of the second growing season as the last month. Under conditions of exceptional plant vigor, the needles of a given season may persist for a maximum period of thirty months. However, this is exceptional, because observations on seedlings in the grass in many localities throughout the South show that foliage in its second growing season is usually partially shed and sometimes entirely gone by the end of November.

METHOD OF INVESTIGATION

In any serious attempt to determine directly the effect of premature defoliation, control of the disease is essential. This has been accomplished by spraying. One set of spraying experiments is under way in a densely-stocked area of natural reproduction where practically all seedlings came from the seed crops of 1920 and 1921. A second spraying test conducted with planted stock is designed to eliminate the influence of root competition caused by high seedling densities and reduce the variations involved in working with natural reproduction. In the former tests, mean height growth has been made the basis for comparison of treated and untreated plots and in the latter work because height growth had been negligible, diameter growth was used for comparing

the development of sound and diseased seedlings.

Where the plots are laid out in natural reproduction, repetition of areas receiving the same treatment was more necessary than in plantations, on account of the variations which are encountered when dealing with wild stock. Spraying many small plots for a comparatively long time has been one of the methods used with this problem.

In order to insure finding a substance which would control the disease without involving chemical injury or stimulation, the following fungicides are employed: 1, Bordeaux mixture; 2, lime-sulphur; 3, colloidal sulphur; and 4, zinc-sulphate and lime. For the purpose of accurate estimation of the effect of the disease on growth, the use of a fungicide which both chemically stimulates the plant and checks the disease would be highly undesirable.

EXPERIMENTAL DATA

Natural Reproduction—During the summer of 1929, 1,200 sprayed plants and 900 unsprayed were tagged and measured. In the succeding summer, these were remeasured, and 2,830 seedlings were measured and tagged for the first time. There are now on the area approximately 5,000 tagged and measured seedlings, scattered among forty-seven plots, some of which have been sprayed for three consecutive growing seasons, and others for two. Twenty-five unsprayed plots were laid out usually alternating with the treated areas. As no height measurements were taken until fifteen months after control of the disease had been started, data on relative growth in the various plots are not available except for the survivors of 1,200 seedlings sprayed with Bordeaux mixture, and 900 unsprayed checks. The mortality among the seedlings was about equally divided among the sprayed and unsprayed.

The average height of these sprayed seedlings was found to be 1.04 inches in the summer of 1929. By the following summer, the average height of the survivors was 1.41 inches. 900 unsprayed seedlings had an average height of 1.12 inches in 1929 which had increased to 1.37 inches by 1930. That is, sprayed plants increased 0.37 inch while the unsprayed averaged a 0.25 inch growth. Though this difference is small, it is significant that the greater growth occurred among sprayed seedlings which were smaller at the start. This relative increase is attributed to control of the needle blight.

To determine the significance of the difference between the two classes of seedlings, twenty-one hundred and seventy-nine sprayed seedlings were compared with nineteen hundred and sixty-three unsprayed. These figures included the measurements of plants treated with Bordeaux mixture, colloidal sulphur and lime sulphur and their respective controls. The difference in average height between the sprayed and unsprayed seedlings was 0.16 inch in favor of the sprayed. As this is 5.3 times the standard deviation of the difference (diff. = .0316) it may be considered a significant difference and due to the spraying which is the only way in which the two classes of seedlings are known to have differed. Unfortunately, however, the seedlings are divided into sub-samples by plots and the plots in turn by groups which differ both as to location, the spray treatment given, and stand density, so simple probability figures do not have the same validity that they might for a more simple population.

If the plot means be taken, and the differences determined between the mean height for each sprayed plot and its control plot of the same number, the mean of these differences is 0.23 inch in favor of the sprayed plots, but the standard error of the mean difference is 0.12 inch.

While more complex analysis of the data would probably eliminate some of the non-pertinent variation and show a lower standard error, the best assurance that the spraying has resulted in increased height is in the fact that the greater height of the sprayed is, despite an average stand density, one-fifth greater than that of the control plots.

To avoid injury to marginal seedlings resulting from trampling or kneeling within the plots, the practice has been to label and measure only those seedlings which were growing within arm's length, with the observer kneeling or sitting at one side. The number of tagged seedlings is therefore less than the total number of seedlings in the plots. The heights in Table 1 are the arithmetic means of seedling heights obtained by measuring to the nearest quarter of an inch and dividing the totals by the number of seedlings measured.

TABLE 1

AVERAGE HEIGHT OF TAGGED SEEDLINGS IN 47 MILACRE PLOTS IN AN AREA OF NATURAL REPRODUCTION, BOGALUSA, LA.
Summer of 1930

	Sprayed			Controls, not sprayed		
	Plot number	Total number seedlings	Average height tagged seedlings (Inches)	Plot number	Total number seedlings	Average height tagged seedlings (Inches)
Bordeaux sprayed three seasons	1	77	1.81	1	111	1.36
	2	342	1.21	2	206	1.40
	3	255	1.46	3	319	1.14
	4	174	1.52			
	5	139	1.56	5	155	1.54
	6	161	1.23	6[1]	79	1.99
	7	177	1.54	7	132	1.27
	8	230	1.32	8	185	1.30
Lime-sulphur sprayed three seasons	A	174	1.78	A	140	1.76
	B[1]	135	1.96	B	177	1.28
	C	157	1.28	C	183	1.20
	D	126	1.65	D	157	1.38
Lime-sulphur sprayed two seasons	1[1]	39	3.02	1[1]	87	2.76
	2[1]	78	2.22	2[1]	90	2.02
	3	73	1.70	3	93	1.54
	4	101	1.32			
Colloidal sulphur sprayed two seasons	1	164	1.61	1	104	.89
	2[1]	112	1.98	2	77	1.56
	3	198	1.65	3	149	1.29
	4[1]	100	2.01	4[1]	52	2.34
	5[1]	43	2.92	5[1]	80	2.05
	6[1]	141	2.47	6	98	1.74
				Controls for thinned plots		
				1[1]	71	1.99
				2	130	1.57
				3[1]	54	2.26
				4	161	1.49
				5[1]	99	1.95

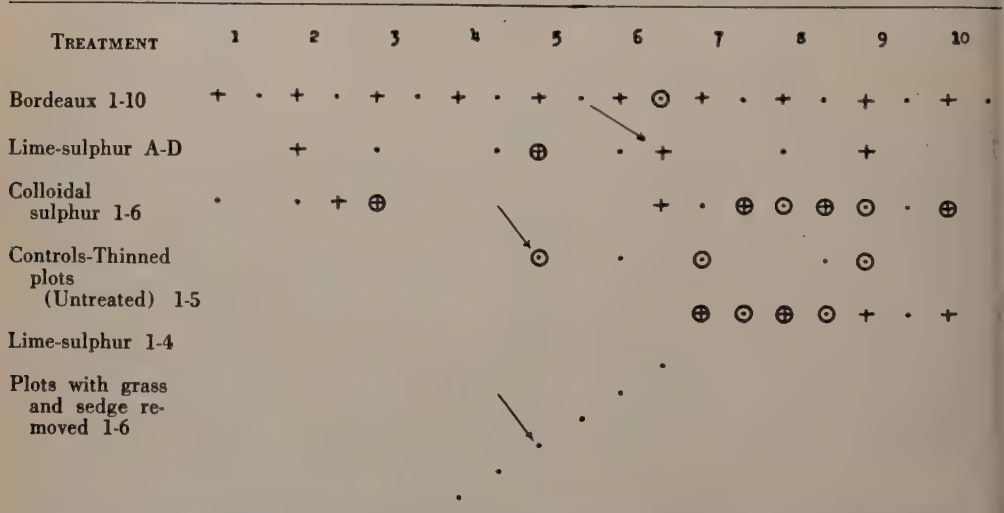
[1]Marks fifteen plots with the highest plot averages. The relative position of these plots is indicated by circles in the diagram of the experimental area, Figure 1.

Planted seedlings.—To eliminate the influence of high seedling density and minimize the variations encountered with natural reproduction on different sites, an experiment was started in April, 1929, with several hundred seedlings, part of a commercial planting of the Great Southern Lumber Company of the previous December. The area consists of a solid block approximately 115 by 200 feet, planted to seedlings spaced 6 by 8 feet. The plants under observation are located in seventeen consecutive rows, at right angles to a public road, and extend in the rows about 200 feet to the west. Field spraying started in April, 1929, and has continued regularly once or twice a month, depending on the season. Lime sulphur is being sprayed on plants in rows Nos. 1, 2, 3, 5, 6, and 7; rows Nos. 10, 11, 13, 14, 15, and 16 are treated with Bordeaux mixture. The untreated seedlings are located in rows Nos. 4, 8, 9, 12, and 17. The area contained 542 plants in August, 1929. A census in December, 1930, (see Table 2) gave the following mortality for the period.

These plants were examined individually, four times in 1929 and twice in 1930. The data gathered included any injury or condition which could bear on mortality, as 1, initial weakness of the seedlings, 2, poor planting, 3, defoliation by insects, 4, trampling by cattle, and 5, amount of diseased tissue.

While it is realized that the totals (Table 3) upon which these percentages are based are, for the most, quite small, some interesting facts can be obtained from this tabulation.

The percentages of mortality from trampling for both sets of plants are the same, due to the character of this type of damage. Trampled plants are usually doubly injured, defoliation and severe crushing of the stem occurring simultaneously. It is noteworthy that none of the poorly planted seedlings protected by spraying have died, although three of eight badly-set and brown-spotted seedlings no longer



Explanatory: Crosses indicate sprayed areas; dots represent unsprayed. The circles mark 15 plots with the highest mean plot heights, listed in Table 1. Arrows show the direction of water flow. The base of the slope runs approximately on the "Lime-sulphur 1-4" row. There is a 70-foot interval between control plot No. 7 in the Bordeaux row and sprayed plot No. 8. The numbers indicate the number of plots in each row that received the same treatment.

Fig. 1.—Diagram of experimental area

Showing relative position of some of the milacre plots laid out in natural reproduction.

exist. Insect defoliation may be partial or complete, but is more serious on unsprayed plants because these usually have less foliage to lose. The estimate of the amount of diseased needle tissue made December, 1930, among sprayed plants was less than 1 per cent, while the infected needle length of unsprayed plants averaged 43 per cent. About 8 per cent mortality among 164 plants is attributed to the defoliating effect of the disease for the seasons of 1929 and 1930.

This study of seedling mortality permits the conclusion that non-mycological factors detrimental to plant development, except trampling by cattle, result in greater mortality when plants are exposed to the disease than when they are protected by fungicides.

The real contrast between treated and untreated plants at the end of the second growing season in the field lies in the difference in plant vigor in favor of those treated. As height growth has not occurred universally in the area, stem-diameter was selected as the best criterion of plant vigor. Diameter measurements in centimeters taken half an inch below the basal needles were made in December, 1930, on the 497 survivors. The arithmetic means of these diameters appear in Table 2.

TABLE 2

MORTALITY AMONG PLANTED, SPRAYED AND UNSPRAYED LONGLEAF PINE SEEDLINGS AND AVERAGE STEM DIAMETERS OF THE SURVIVORS IN DECEMBER 1930

	Number August 1929	Mortality December 1930	Mortality per cent	Average diameter
				centimeters
Treated				
Lime sulphur	181	12	6.6	1.50
Bordeaux	197	10	5.0	1.62
Untreated	164	23	14.0	1.00
Total	542	45		

GROUND COVER

Judging from the size of the trees formerly growing on this area, as indicated by the remaining stumps, the site quality of the two acre area is practically uniform and from the standpoint of considering the growth of the mature tree, the area may be regarded as one site. But the site must be considered differently when applied to the natural reproduction The site quality with reference to seedling growth varies. From this standpoint the area is divided into the three following seedling sites: First, spots where the seedlings are merely existing on bare mineral soil, where erosion has apparently permanently exposed the subsoil; second, places where some surface soil persists, permitting a moderate amount of ground cover, and occasionally very dense stands of natural reproduction; and third,

TABLE 3

ANALYSIS OF MORTALITY

Seedlings with	Number of seedlings	Mortality	Mortality per cent: On injury class, first column, as basis	Mortality per cent: On all seedlings as basis
Unsprayed seedlings				
1. Initial weakness	16	3	18	2
2. Poor planting	8	3	37	2
3. Defoliation by insects	23	3	13	2
4. Trampling by cattle	24	5	20	3
5. None of the above	93	9	9	5
Total	164	23		14
Sprayed seedlings				
1. Initial weakness	46	5	10	1
2. Poor planting	18	0	0	0
3. Defoliation by insects	22	2	9	.5
4. Trampling by cattle	50	10	20	3
5. None of the above	242	5	2	1
Total	378	22		5.5

areas nearer the base of the slope where the ground cover is heavy, with a considerable accumulation of humus, where seedlings are appreciably taller, more vigorous and scattered.

The influence of the character of ground cover on initial seedling density and growth is fundamental. Heavy cover, by physically obstructing the downward passage of seeds to mineral soil and later by competition for light and moisture with those that have germinated, reduces initial seedling density for a given area. On the other hand, particularly during the early rosette stage of the seedling, ground cover acts as a protection against excessive defoliations caused by the needle disease. It indirectly benefits the seedling by a reduction of the rate of surface evaporation and by protecting the soil from all types of erosion and extremes of soil temperature. Its decomposition produces a layer of humus which stays in place. With well established seedlings, heavy ground cover is undoubtedly of assistance in starting the height growth which carries the foliage above the zone of severe needle infection.

The influence of the character of ground cover on the brown-spot needle blight near Bogalusa was clearly demonstrated when all vegetation except pine seedlings was removed from several plots of natural reproduction. For the season of 1929, removal of all vegetation increased the average amount of disease from 24 to 43 per cent. For the following season, the disease averaged nearly 68 per cent among the same plants in the same denuded areas. The average amount of disease in alternating control plots was 24 per cent each season. Effect of the removal of the ground cover when continued over two seasons is, therefore, cumulative. The results account for the generally weak condition of dwarfed natural reproduction from the same seed crop, now growing on permanently eroded hill tops and slopes.

To repeat, all variations in soil cover can be encountered from bare subsoil to dense grass and sedge. Upon the poorest spots, pine seedlings are the only things living. Plot C (lime sulphur sprayed) contains such an area. Although the 9 and 10 year old seedlings in this area have been protected for three successive growing seasons from the dwarfing effect of defoliation, average height for the plot was but 1.28 inch in the summer of 1930. The only marked difference between Plot C and three others laid out at the same time and subsequently treated in the same way lies in sheet erosion, which, due to greater slope of the ground on the uphill side, has exposed the mineral soil upon one-half of the plot.

Eleven of fifteen milacres (see footnote Table 1 and plot diagram, Figure 1) with the highest plot means are grouped together in the southeastern portion of the area near the base of a slope. Of these eleven plots, five had been sprayed for two successive growing seasons and six were untreated. Occurrence of high plot averages among check plots and the grouping in one corner of the area signifies that average seedling height was greater there at the beginning of the tests. Seedlings had developed better there, since from their location at the foot of the slope they had received accumulations of top soil from the erosion above. Also, on account of their location, they probably received a greater amount of water. Relatively low seedling density and a better location resulted in more vigorous seedling development.

Seedling Density

Mattoon (3) referring to fairly large longleaf saplings has written, "Thrifty, well-stocked stands of longleaf soon become overcrowded, and a great competi-

tion arises among the trees, the foliage seeking for light and the roots for soil moisture. Longleaf does not readily thin itself by the natural dying out process, but many of the smaller trees may live years in a practically dormant condition."

The struggle for light and moisture among large sapling stands is probably more severe than the competition that occurs in areas of dense seedling reproduction, where there is little interference between the plants for light. There is abundant evidence in the Bogalusa region that dense seedling reproduction does not thin itself readily.

It has been suggested that root competition from grasses and sedges also plays a part in retarding seedling height growth. Apparently the beneficial influence of heavy grass cover overshadows any retardation that the roots of grasses are causing in themselves. This is brought out by the fact that where the ground cover is most luxuriant, eleven of the fifteen plots with the highest plot average height are grouped together. As a factor in the dwarfing of these seedlings it is root competition caused by the density of natural reproduction that must be considered rather than competition from shallow-rooted grasses and sedges. It is recognized, however, that the effect of cover is difficult to evaluate merely from observation. The areas of heavy grass cover are probably those where the soil was originally best or moisture supply greatest. The good condition of pine where grass is heavy may be due to the originally better soil and moisture conditions in such places and because of a screening effect of the grass in hindering dissemination of the brown-spot fungus, and despite a considerable reduction of moisture by the grass roots.

In Table 1, average height of tagged seedlings is compared with total number of seedlings in the plots. A tendency is indicated for average seedling height to vary inversely with density where seedlings are less than 100 to the milacre. All sixteen plots containing less than 100 seedlings to the milacre have average height of tagged plants in excess of 1.5 inch. The five plots with seedling densities exceeding 200 to the milacre had average heights below 1.5 inch. Of the plots with intermediate density, approximately half were above 1.5 inch.

Conclusions

1. Data presented indicate that for the area studied, the development of natural longleaf seedling reproduction is affected by a number of variables, of which the most important are the brown-spot needle blight, the character of ground cover, and high seedling densities.

2. The effect of these variables acting perennially since 1921 on the reproduction area studied is reflected in their generally dwarfed condition today.

3. While the influence of the brown-spot needle blight is generally adverse, on the better sites the disease may be negligible and its dwarfing insignificant. This dwarfing influence is attributed to reduction in photosynthetic activity that the fungus causes through premature defoliation. Observations on 164 unsprayed seedlings planted from uniformly graded nursery stock indicate that the disease caused about 8 per cent mortality by the end of the second growing season. The real difference between diseased plants and others kept clean by spraying is best shown by the greater vigor of the sprayed. The effect of the sprayings increased the average diameter of the treated seedlings one and a half times that of the unsprayed in adjacent rows.

4. Ground cover, which is a good index of seedling site, determines primarily the density of natural reproduction. After the plants are once well established, and be-

fore height growth occurs, the ground cover partly shields seedlings from the disease as indicated by its increase on artificially denuded areas. Apart from this effect, the influence of heavy cover on seedling site assists in starting the height growth, which, when it continues, invariably carries the foliage above the zone of maximum infection. This appears to be within the first eighteen inches of the ground. In the absence of this cover, usually on eroded slopes and hilltops, seedlings are retarded in development by perennial defoliations.

5. Root competition caused by abnormally heavy natural reproduction is a factor in growth retardation though apparently less important than ground cover.

PART 2. INFLUENCE OF FIRE AS A METHOD OF DISEASE CONTROL[4]

As a method of disease control, periodic winter burning has been advocated by Chapman (1) who has reported more losses from the brown-spot than from spring fires. To determine on the broadest possible basis the influence of fire on the disease, an investigation has been in progress since 1929, involving several widely separated localities, where fire history was known and longleaf seedlings were growing on different sites. This study had for its purpose a determination of the effect of a given fire on the disease and the duration of this effect.

Assumption of the Investigation

An assumption in this investigation is that premature leaf death is due almost wholly to one fungus, *Septoria acicola*. Other fungi are known to occur on the dead needle tissue but the first fungus that appears on new spring foliage is almost invariably the organism that causes the brown-spot. It is impossible to accomplish the work rapidly and examine every plant to see if the pustules of the fungus are present on the needles.

Method of Estimating the Disease

In starting this investigation, it was necessary to determine on some practical method of estimating the amount of brown-spot. Considerable space will now be devoted to an explanation of the means of arriving at these estimates because an understanding of the figures—the averages of percentile plants—requires a knowledge of the methods employed in their attainment.

A random collection of seedlings is taken on the area selected for study. The collection is best made by two men. One man, ahead, steps a definite number of paces, stops and cuts off the nearest seedling close at the ground. The second man, behind, with a sack, collects the cut seedlings, and the operation is repeated until the required number of plants have been obtained. For this work, only areas with abundant natural reproduction are of service. When collecting seedlings from a burned area, attempt is made to gather at several hundred feet inside the burn in order to avoid the influence of multiple infections which come in from the unburned margin.

The next step is to place the seedlings side by side on the ground in the order of leaf infection. The median plant can be described as the middle plant in the array, the deciles are those plants that

[4]Thanks for generous assistance in this investigation are due Mr. Posey N. Howell, Forester for the Moss Point, Mississippi, mill of Southern Kraft Corporation, and Mr. Earl King, Forester for the Industrial Lumber Company, Elizabeth, Louisiana.

divide the array into tenths, and the percentiles are those plants which divide the lot into hundredths.[5] To illustrate; the fifth percentile in an array of 300 seedlings ranked in order of infection, would be the fifteenth plant in the series. The fifth, fifteenth, twenty-fifth, thirty-fifth, etc., percentiles in this series would be, accordingly, the fifteenth, forty-fifth, seventy-fifth, one hundred-fifth seedlings in the lot.

The difficult part of the work lies in correct arrangement of the plants in order of leaf infection. The difficulties increase directly with the number of plants in a given collection and the amount of foliage infection. To rank somewhere near correctly, in order of leaf-infection, a collection of six hundred seedlings, most of which are badly brown-spotted, will take a day's time.

When a given array of seedlings has been ranked on the ground in order of infection, definite percentile plants are selected by counting off, starting at one end of the series. Where the fifth, fifteenth, twenty-fifth, thirty-fifth, etc., percentiles are desired for instance, in a lot of seedlings, the fifteenth, forty-fifth, seventy-fifth, one hundred-fifth, etc., seedlings are gathered and tagged. When ranked in order, these percentiles quite accurately represent the series. The mass of seedlings is discarded and the ten percentiles are taken where they can be carefully measured. All leaves are removed from the percentile sample plants fascicle by fascicle. Usually, as the plants are fresh, the leaves adhere to their respective fascicle. Needles are placed beside a ruler on a table and first measured and recorded in inch classes. Then the dead portion of the leaf is measured. If spotted tissue occurs on a leaf, a proportionate part of the spotted length is added to the needle length actually dead, to determine the total amount of dead tissue. With the total leaf length known, the measured dead section is recorded in terms of percentage of the leaf length. This percentage is read from a table which records the percentage that each inch bears to the total leaf length, figured out from 9 to 20 inches. The percentage of dead leaf length is grouped to the closest 5 per cent class.

A part of the record on which this paper is based is listed in Table 4 to illustrate the type of data obtained from this work. The seedling collection was made in September 1930. The average percentage of dead needle tissue for the area was 25.0.

LOCATION AND DESCRIPTION OF AREAS STUDIED

Investigations of the effect of fire on brown-spot infection have been conducted in the following localities: (1) The South Pasture of the Great Southern Lumber Company, near Bogalusa, Louisiana (Washington Parish); (2) the eastern part of Jackson County in southeastern Mississippi; (3) Allen Parish, Louisiana, near the town of Elizabeth; and (4) Lanes, South Carolina. Collections from the areas in the Gulf States were made between September 24th and November 5th, 1930.

1. South Pasture, Great Southern Lumber Company, Bogalusa, Louisiana.

The effect of fire was studied on an eight hundred acre burn, swept by fire on March 21, 1928, part of a large area that had burned over in the early fall of 1920 about the time of logging. The heavy seed crops of 1920 and 1921 produced a dense stand of reproduction, averaging 20,000 seedlings to the acre.

Just to the south is an area not burned

[5] An introduction to the theory of statistics by G. Udny Yule, Charles Griffin and Company, London, 1924.

in March, 1928, and where most of the area is growing up to longleaf of the 1921 seed crop. It received the same logging treatment, and last burned over in early fall of 1920. A small section is heavily stocked with dwarfed seedlings but the greater part consists of seedlings or saplings putting on good height with a fair amount of seedlings still at grass height. Seedlings averaged about 1,500 to the acre. Topography and soil of these two areas are apparently similar.

2. Jackson County, Mississippi.

The locality examined is about 28 miles east of Saucier, Mississippi, and west of the Pascagoula River. An area of 4,200 acres was swept by fire on March 2, 1930. Seedlings were collected about half a mile from the nearest unburned areas. The land had been logged fairly conservatively and reproduction was abundant.

A collection of seedlings was made well inside a 600-acre tract burned over in January, 1929. As an area it was distinctly understocked with dense stands of reproduction only in the vicinity of seed trees. Seedlings averaged about 250 to the acre.

TABLE 4

RECORD OF MEASUREMENTS OF PERCENTILE SEEDLINGS, BOGALUSA, LA.

Percentile plant number	Summation of per cent dead tissue[1]	Total number of leaves	Average per cent dead tissue
5	11,710	382	30.6
15	7,910	248	31.8
25	26,725	867	30.8
35	5,495	199	27.6
45	11,085	457	24.2
55	11,340	402	28.2
65	2,890	149	19.3
75	2,410	108	22.3
85	675	32	21.0
95	3,100	214	14.4

[1]The figures in the second column are the sums of percentages of dead needle tissue determined for each needle by measurement with a ruler. The average percentage of dead needle tissue per plant was obtained by dividing each figure in Column 2 by the respective number of leaves on the seedling.

A third collection of seedlings was made from an area unburned at least since 1923. The collection came inside a fenced pasture where seed trees had produced a good stand of seedlings. The area was fully stocked.

3. Allen Parish, Louisiana.

The areas visited are located a few miles west and southwest of Elizabeth, Louisiana. The first collection area had been burned over in February, 1930. Seedlings were about three years old. The area was understocked and seedlings occurred principally in the vicinity of seed trees. At least 500 acres were covered by the burn. Another collection was taken from a 160 acre fire in January, 1929. The area was understocked; deficiency in number of seedlings was apparently caused by hogs.

A last collection was made from a fenced pasture. The area had burned in 1925 after spring growth started. Seedling density was about 900 to the acre.

4. Lanes, South Carolina.

This locality is in the Atlantic Coastal Plain. In its logging history and subsequent treatment the area is quite unlike the other three. Fire had been kept out of one tract since the spring of 1920. Dense pole stands of longleaf and loblolly are rapidly crowding out seedling longleaf, even those that have put on height. Many of the small plants are being covered up by needle litter from large trees. Even grass is dying out through suppression by the dominant trees. Except for a great reduction in seedlings and litter in the area burned over annually, it is essentially like the unburned.

EXPERIMENTAL DATA

For the first three areas, the data were gathered from percentile sample plants after the method described. At Lanes, S. C., the estimate of the disease is the

mean of leaf infection for 51 seedlings in unburned plots and for 62 seedlings in burned areas.

Variation in Disease on Four Unburned Sites

Table 5 records the variation in incidence of disease in four widely separated localities, none of which had been recently burned. The differences are ascribed partly to the influence of site variations on the disease. The three Gulf States areas had the same general climate in 1930—abnormally dry weather in the spring and most of the summer with normal rainfall in August and an excess of precipitation in September.

There is some reason to suspect that the average amount of disease for a given unburned area varies directly with the density of seedlings where these are of infection-stage size. It is known that the disease varied quantitatively with seedling stand density for the first three localities listed in Table 5. Field observations in other parts of the longleaf region tend to bear out this generalization. Its obvious explanation is that the average amount of infection in an area should be proportional to the amount of spores produced on or blown into that area.

Evidence has been obtained that a dry growing season results in a reduction of the disease in a given area. The almost year-round development of the fungus on pine needles has been referred to early in this paper. The combination of both factors causes the wide divergence of figures (61.5 per cent Table 6 and 29.6 per cent Table 5) obtained for the per cent of dead needle tissue on unburned land near Bogalusa in March, 1929, and September, 1930, respectively. The collection of September, 1930, had the fungus in development for only six months, April to September, of a notably dry season. Seedlings gathered in March, 1929, showed the status of the disease on needles of the previous year after twelve months' infection for the specific site under normal weather conditions.

There was less disease on the unburned area near Bogalusa (19.5 per cent compared with 32.1 per cent, Table 6) than on the burn of 17 months before. Theoretically, the amount of disease on a burn would be expected, after a lapse of time, to equal, not exceed, the disease on an adjacent unburned area. From facts presented in part 1, these differences are explainable on the basis of differences in infection encountered on the same area with variations in soil cover and seedling density, as well as unavoidable errors in arranging the collected seedlings in order of infection intensity. It should be understood that the course followed in making collections on an area varies from year to year.

Table 6 shows the relationship of the disease to the period elapsing since the time of burning. For the four localities listed, the reducing effect of a winter or

Table 5

VARIATION IN DISEASE ON FOUR UNBURNED SITES

Locality	Date of last fire	Date of examination	Average per cent of dead needle tissue
Bogalusa, La.	1920	Sept. 1930	29.6
Jackson Co., Miss.	1923	Oct. 1930	17.8
Elizabeth, La.	1925	Nov. 1930	16.6
Lanes, S. C.	1920	Dec. 1929	1.2

early spring fire on the disease was demonstrated for the season following the fire. By the end of the second growing season, the reduction in disease due to a single fire was negligible on two of three areas. However, in southeastern Mississippi there was an appreciable reduction in the amount of disease which was due to a fire that had occurred twenty-one months before. There is some evidence from the data that the duration of the period of disease reduction ascribable to fire is shortest in localities where the disease is normally epidemic and longest where it is normally endemic.

Under certain circumstances, the sanitary effect of fire may be reduced. A lack of inflammable material at any point in a burned area due to a previous deficiency in herbaceous cover may result in incomplete eradication of diseased needles. This usually happens where diseased seedlings develop on bare mineral soil. Following fire, these spots of incomplete combustion act as local centers for the disease in the interior, adding to the infection which works its way in from the unburned margin.

Effect of Fire on Seedling Survival and Development

Apart from the effect of fire on the brown-spot, the effect of fire on seedling survival and development should also be considered. Some information on this subject has been gathered from annual observations made on 629 longleaf seedlings from the 1920 and 1921 seed crops. These seedlings were on five small plots established a few days after a fire on March 21, 1928, had burned an 800 acre area near Bogalusa that had been unburned since September, 1920. Total area of these five plots was 13 milacres.

In December, 1928, there were 576 living seedlings, indicating a mortality of 53 plants or 8 per cent, which could largely be laid to the fire. Of the 576 seedlings that survived, 97 or 16 per cent had lost the terminal bud through fire, but had sprouted. In two densely seeded plots in an adjacent unburned area of natural reproduction of the same age where brown-spot was heavy, there was a loss of four tenths of one per cent

Table 6

THE RELATION OF BROWN-SPOT NEEDLE BLIGHT TO THE PERIOD ELAPSING SINCE BURNING

Locality	Date of fire	Date of examination	Average per cent of dead needle tissue	
			Burned area	Unburned area
First season				
Bogalusa, La.	Mar. 1928	Mar. 1929	21.1	61.5
Jackson Co., Miss.	Mar. 1930	Oct. 1930	0.2	17.8
Elizabeth, La.	Feb. 1930	Nov. 1930	1.3	16.6
Lanes, S. C.	Jan. 1929	Dec. 1929	0.4	1.2
Second season				
Bogalusa, La.	Mar. 1928	Sept. 1929	32.1	19.5
Jackson Co., Miss.	Jan. 1929	Oct. 1930	9.0	17.8[1]
Elizabeth, La.	Jan. 1929	Nov. 1930	15.9	16.6[1]

[1]At Bogalusa, La., the effect of one fire was studied by examining the same burned and unburned areas at two different times. However, in order to determine at a single visit, the effect of first and second season burns it was necessary to study the effect of two fires and for comparison an estimate of disease was made on a third area, unburned. This procedure was followed in Jackson County, Mississippi, and near Elizabeth, Louisiana.

compared to eight per cent mortality on the adjacent burned area.

As the ground cover was seven seasons old, the March, 1928, fire was a severe one. Furthermore, it came too late in the spring to be a good demonstration of the use of fire in forest management. Fire can be credited with reducing the amount of brown-spot for the following season, but on the other hand, it caused an 8 per cent mortality besides delaying height growth on an additional 16 per cent of the surviving seedlings through killing the terminal bud. Had the area been understocked to longleaf seedlings, this result would have been more serious.

Conclusions

1. A single fire reduces the brown-spot needle disease for the season following the fire. The amount that the disease is lessened varies with the locality. On a previously heavily infected area, the disease was reduced to one-third the amount on an unburned tract.

2. In the absence of fire the amount of disease will be found to vary with the site.

3. By the end of the second season, the influence of a fire on the disease was negligible on two of three areas. On the third area the amount of disease was one-half of that on an unburned tract.

4. A fire burning through six-year rough caused eight per cent mortality and delayed the height growth of a sixth of the survivors by killing the terminal bud. On an adjacent unburned area the mortality from all causes was four tenths of one per cent.

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Incendiary or wilfully set fires to the total of 309 were started on or near the national forests of Oregon and Washington during the 1931 forest fire season, according to the annual report of the Regional Forester, Portland, Oregon. This is over one-fourth of all the man-caused forest fires for the season. These incendiary fires were responsible for 48,408 acres burned, $173,637 in damages, and suppression costs of $161,369.

SOME RELATIONS OF FIRE TO LONGLEAF PINE

By AUSTIN CARY

Logging Engineer, U. S. Forest Service, Lake City, Fla.

The varying effects of the different types of fires encountered in the longleaf pine region are discussed by a man of long practical experience in the southern pine region. Summer fires are found to be more destructive than winter fires. Height growth of young trees may be halved the year following a fire but its normal rate may be resumed in the second or third year. The author shows how a private owner may make simple investigations to determine the effect of fire on his timber.

THE FACT may or may not be widely understood among members of the Society and readers of this JOURNAL that the relation between longleaf pine and fire has been the subject of late of considerable debate, not to use a stronger term for it.[1] One fact indeed is uniformly accepted—that this tree species stands fire better than any other of those that are familiar. This is true of small trees as well as large, and aside from any general physiological peculiarity that may be involved, is attributed to the resistance of the buds, shielded from heat as they largely are by the leaf bases. It is well known that longleaf may be entirely defoliated, and yet, if the buds are dormant and not killed, it will survive and put out foliage the following season.

INFLUENCE ON YIELD OF NAVAL STORES

The writer has had opportunity to inquire into this matter of late from two directions. First, of the gum-yielding power of the tree after defoliation. Several years ago on a turpentine place in South Carolina, a piece of land was observed on which cups had just been hung after fire had run over the ground to clean up the dead grass and trash and so lessen fire risk. For long this was the general practice among turpentine operators, not only at the start of operation but annually thereafter, the faces and cups being protected by raking around them.

The effects of this burning in the present instance had been various. Some trees had only the bark scorched on a portion of their trunks; with others, more or less of the lower foliage had been killed; there were spots, however, where the foliage had been completely burned off the trees, leaving only the buds living. That was in timber approximating 60 feet in total height, of fair development from the producing standpoint. The method of experiment was to match up trees of like size and condition into groups of 20 each and have the gum that they produced weighed separately through the following season.

The results were striking. Taking as a standard, the yield of the trees whose foliage had not been touched, trees that lost in the fire from one-fourth to one-third of their foliage yielded so little less that it was not clear that the fire had affected their yielding capacity. For the trees entirely defoliated, the result was different; 30 per cent of the trees died as a result of the fire and gum working combined; the yield of gum per tree for the survivors was about half that of unscorched trees. This, however, seemed remarkable in view of the fact that the trees had only a third or less of the normal amount of foliage to work with.

So much for the first season. To test the

[1] "The Forest that Fire Made," by S. W. Greene. American Forests, October, 1931. See also "My Experience with Fire in Longleaf Pine," by P. N. Howell, American Forests, March, 1932, pp. 155-157.

power of recovery, the experiment was continued with the following the most noteworthy result. With the second year, when they had two years' foliage on them, two-thirds the working equipment of normal timber, the trees that started bare produced so nearly the same as those unaffected by fire that one could not say surely their yielding power had been damaged. The results of the third year confirmed previous inferences.

In this particular field there remain only two points to note. The first is that the severe fire (there has been none on the land since) depressed the diameter growth of the defoliated trees somewhat—this was inferred from remeasurement made as accurately as possible on the groups comparatively. The second is that the results in yield of gum have been generally confirmed by a second and later test. Early in 1931, at a Florida point, trees on which it was estimated that two-thirds of the foliage had been destroyed by a recent fire were matched up with others that had escaped because across a railroad track. In this case again the foliage still remaining on the scorched trees was supplemented by that grown later from the still living buds; but that considered, it seems surprising that the yield of gum for the season should be only seven per cent lighter. These observations confirm in their field the general understanding that a very high power of resistance to fire resides in the longleaf pine species.

Effects on Growth of the Tree

The other line of inquiry that has been followed with some care and detail is the relation of fire to growth of longleaf. On this head it should be said that anyone who has been for any length of time in the forests of the South must be provided with a stock of such observations. Fire in the past has had much more than freedom in the longleaf forests and the results are to be seen everywhere and in various forms. Accurate, purposeful observation is another matter, however. The observations here recounted were made in Baldwin County, Alabama, between Pensacola and Mobile and not far from the Gulf of Mexico. This region has longleaf second-growth in all stages and in more profusion probably than any other portion of the South. The soils are not only adapted to the species, but of good quality, favoring rapid growth. Here as elsewhere the practice of firing the woods has long been habitual, but of late years a number of progressive owners have been protecting their property. Good facilities for the study were afforded therefore.

The method of observation followed requires a few words. For the most part it was stem analysis. Stumps were usually cut four feet from the ground for the reason that below that point the effects of fire were hard to determine, while the inferences that might be drawn would have little application to a managed forest. Age at that height has uniformly assumed as eight years. Annual rings were carefully counted, particular attention being paid to fine ones which often give a clue to fire history; usually measurement was made of width of rings also, by groups, although the history of height growth was the main object of the inquiry. Cuts were then made at intervals along the tree, in each case near the base of the internodes which in young timber are usually quite evident, and the ring count and measurements repeated; total height of the tree was, of course, obtained. Proceeding thus on the timber that first came to hand, burned more or less often and severely, the graph shown in Figure 1 was derived, the course of height growth represented. The full line at the left represents the best that was found, what it was inferred at the time might be the course of height growth under protection; the middle line relates to the tallest tree observed; the line at the right

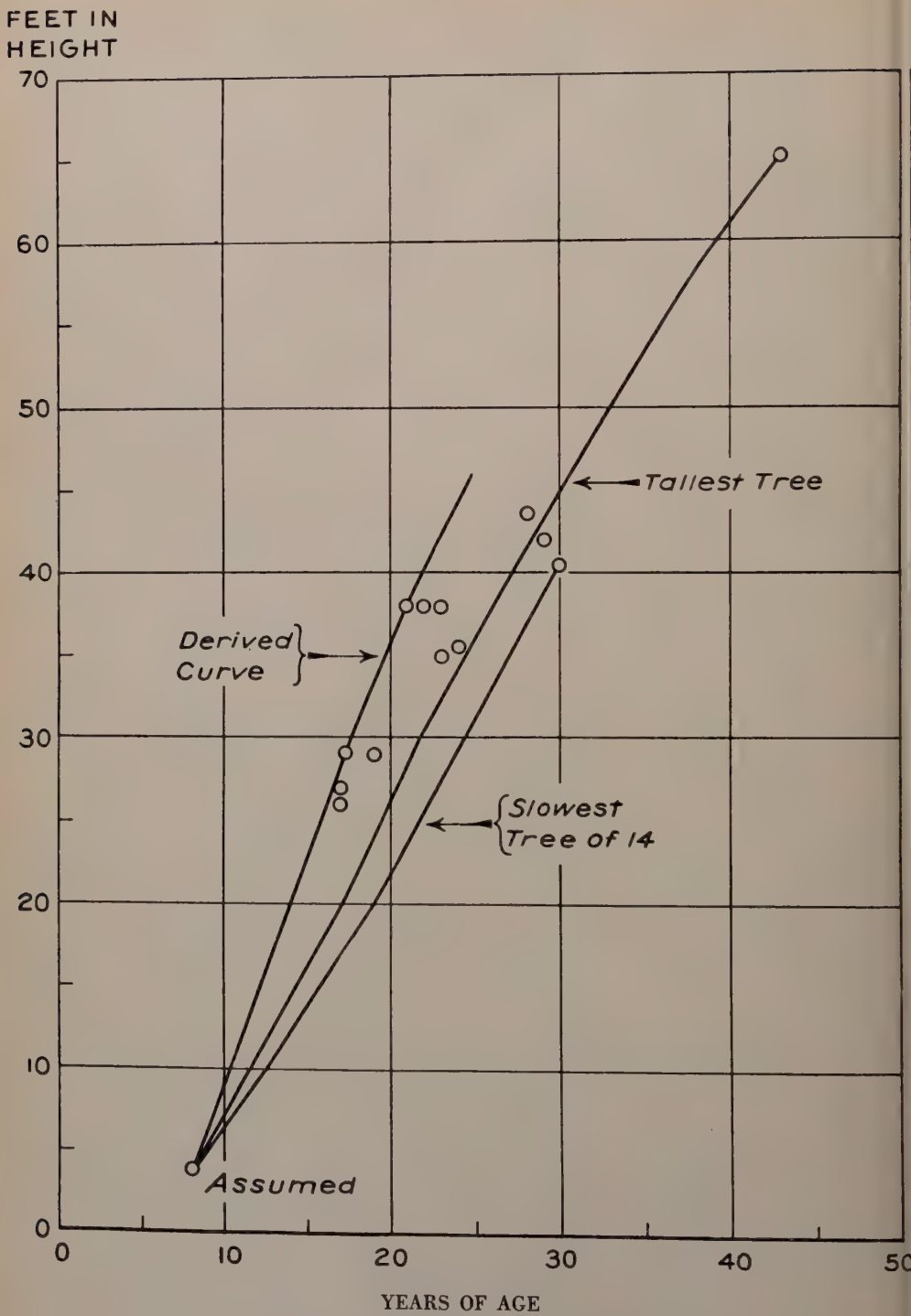

Fig. 1.—Preliminary plot of height growth.

gives the history of the slowest tree of 14 cut down.

Normal Height Growth, Fire Excluded

This much for a tentative start. Next, through search and inquiry, some pieces of ground untouched by fire for a considerable number of years were located and similar data obtained. A noteworthy point at once came out—that the rate of height growth of the trees never burned was materially greater than that of any that had been found thus far. Before the job was finished this observation was repeated at about a dozen different points, the results proving surprisingly consistent. The course of what may be called "normal height growth" was thus derived and is shown in Figure 2. The circles represent height on age. Again attention may be called to the fact that counts and measurements start four feet from the ground.

Actual Growth in the Past Compared

This normal course of height growth ascertained, confirmed and plotted as just stated, a number of questions arose. First to be taken up is height growth as in past times it seems to have occurred in the region.

The second, longest, curve in Figure 2 represents this in a general way though naturally some little variation was found in it. It falls below the other line, persists in so doing. For this, different explanations may perhaps be framed up, but the relation of fire to growth seems by far the more probable one. "Burning the woods" is an old established custom in the territory concerned; young growth treated the same way is following the precedent. A depressing and persisting effect of fire on growth, is therefore inferred.

Summer and Winter Fire

At two points 5-year old burns were encountered, occurring after years of protection so that fuel for fire had accumulated on the ground and in times of low humidity in June or July. These were both so severe that in spots timber 50 or 60 feet in height was killed, something that does not occur with ordinary or winter fire. The effects were ascertained on rate of growth in both height and diameter, and in both directions found to be severe.

For diameter, borings were made in the larger timber, 7 to 10 inches in diameter and 50 or 60 feet in height, and measurements taken of 5-ring belts deposited before and after the fire. The average of several observations indicates a depressing effect to the extent of about 25 per cent. That persists, too, in most cases to the date of observation, though it is true that numerous trees showed considerable recovery in the fifth year. Height growth was tested by the method eariler explained, on young and thrifty trees around 40 feet tall. A curve in Figure 3 shows the results in one case, the measurements of three trees combined in it. Apparently during the five years of the fire and since these trees have made less than half the gain they would have made had there been no fire. The shrinkage in the other case was about 30 per cent.

Recovery After Ordinary Fires

Persistence of the depressing effect on growth seems to be characteristic of summer fires. Apparently this is not true, to any such extent at least, of fire running at other seasons. It was not, of course, possible in a study of this kind to ascertain the season and other circumstances of all fires of which evidence in growth was found. It did seem perfectly clear, however, that winter fire, so severe that height growth of the season following is checked down to a half or third of normal is very frequently recovered from in the second or third year. Not always up to the normal rate, however-as was made clear in earlier paragraphs.

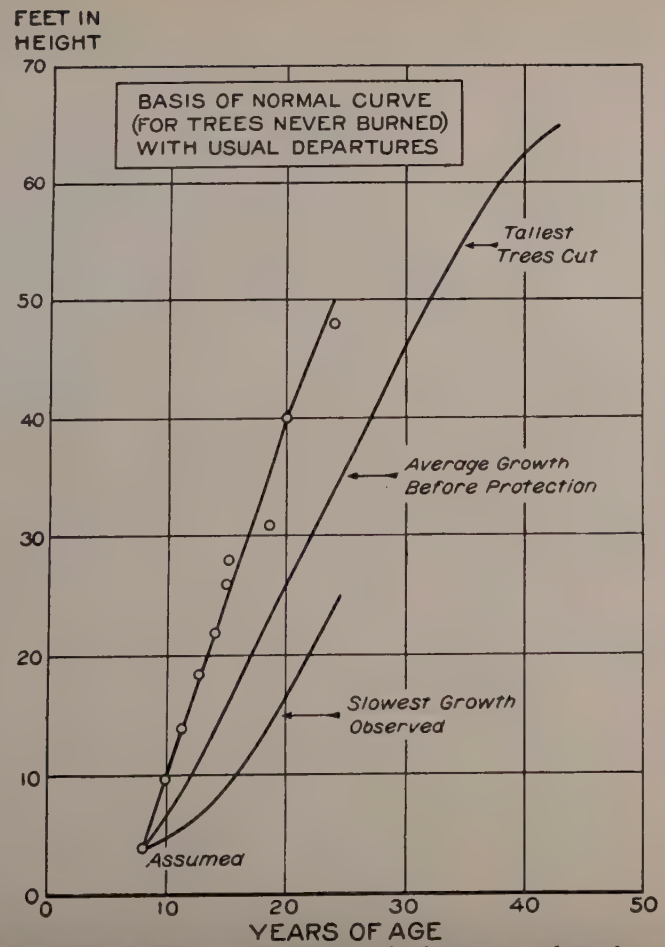

Fig. 2.—Course of height growth of trees never burned.

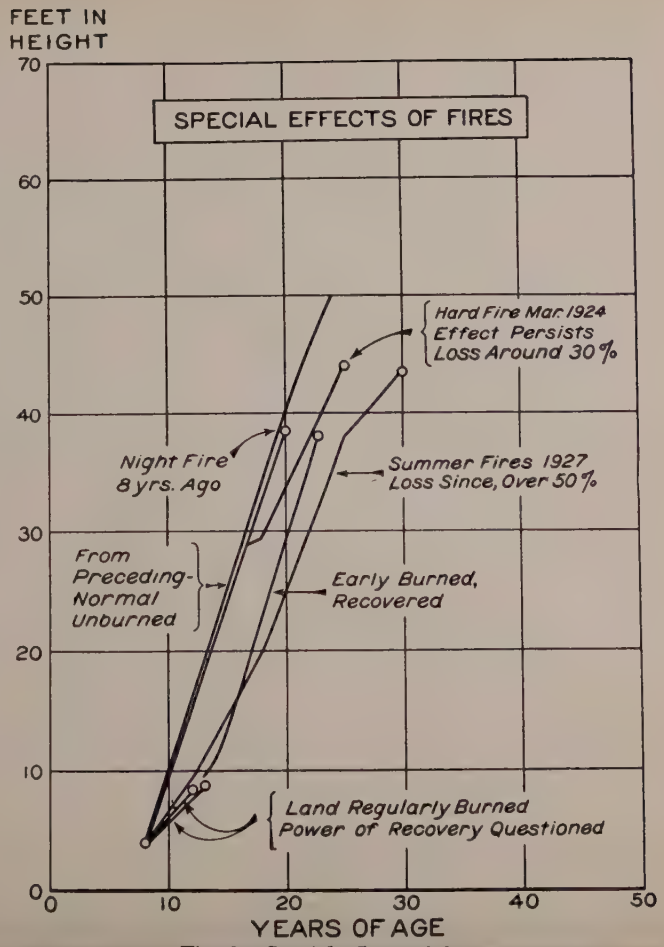

Fig. 3.—Special effects of fires.

One of the curves on the third diagram illustrates this last in the case of a hard March fire with two years' grass on the ground. Height growth that year was less than a foot; the next season it largely recovered; but the gain for the eight years since the fire occurred is considerably under the normal rate.

These effects certainly will vary with the severity of the fire; another curve discloses no apparent effect from a quiet fire running in winter and by night. Repetition also must have its effect. Then there is another possible element in the case, the age (and consequent height) of the young timber affected. On these heads the following conclusions were reached: First, that fire going over very small trees before they have started their height growth may not check subsequent gowth; also that up to 15 feet in total height at least many trees that have been subjected to enough fire to strongly check growth up to that point, if afforded protection, quickly recover and resume growth at the normal rate. A curve in Figure 3 illustrates this relation also. Second, taller trees, those 30 feet high or more, appeared not to retain the power of recovery to the same extent. This might be due to their having been burned more frequently. Of course it is understood throughout that enormous numbers of young longleaf, both before and after they have started height growth, are yearly killed by fires in the southern woods.

Effect of Light Annual Fires

This point was covered by three parallel observations on trees standing on ground annually burned over in early winter as a matter of protection for turpentine cups and faces against similar timber nearby strictly protected from fire for a considerable number of years. Figure 4 illustrates the findings.

In Case 1, the ground had been burned over with extreme care, as lightly as it could be burnt at all, according to the local ranger informed and interested in everything concerning fire protection. The parallel observation was made about 100 yards away, across a fire break maintained on a property boundary. Six trees were analyzed in all, three on each side. The finding is that in the last six years the trees on the burned land grew 10 feet in height against 13 feet for the other timber.

In the second instance the burning was reported as having been done with caution also. Again three trees were cut on the land burned over, from branches of thrifty young growth. They averaged 21 years old at a 4-foot stump and a little over 40 feet tall. Their height growth for the last 5 years was a little less than seven feet on the average.

To compare with this, figures taken from timber of similar development that stood about one-half mile away and had for 10 years been strictly protected were available. Four years younger than the other trees, they were two feet taller. Instead of less than seven feet, they grew between 13 and 14 in the last five years.

In the third instance, the land on which turpentine had been worked had been more roughly treated. Instead of solid banks of young growth characteristic of the protected property, young trees of some size were scattered and small and considerable areas unstocked. The corresponding diagram represents height growth as found on the two sides of a fire break and nothing further need be said on the topic.

This study was conducted in December, 1931. Mr. W. R. Becton, a forester in private employ, assisted in it and employees of the Tennessee Land Company coöperated. It does not profess to be exhaustive, but only such as a land owner largely interested and alert might conduct in his own interest if he were equipped for it. At that, however, 166 trees were cut and analyzed during the course of the work, and the results seem to throw important new

light on the subject. Major conclusions are summarized below; practical inferences to which they may lead will not be stated. However, it seems desirable to say, that while the findings are uniformly against fire, it does not prove that fire nowhere and at no time does good in these forests or that use cannot be made of it. A point that came out strongly on the property chiefly involved, protected for 10 years and with good success for the most part, is the fact that the stands now around 35 or 40 feet in height were in a general way desirably stocked for profitable growth, due to thinning by fire in early life apparently, while the younger stuff, grown up under continuous protection, was much too dense. It would cost materially to thin it down to a desirable condition. Otherwise, the points suggested under this head will not be treated.

Conclusions

1. At other points as well as that where this study was made, and on the same basis of stem analyses, the inference has been drawn that longleaf pine as it grew up in past times was checked in its development by the frequently recurring fires of the region. If that is the case, site classification based on native timber will not hold for managed forest and does not do justice to the influence of climate and soil.

2. Summer fire is much more damaging than fire in the dormant season. In certain conditions it kills sizable trees; growth rate is apt to be heavily reduced, the effect long persisting.

3. The effect of winter fire run over the ground varies very widely with the weather conditions and the amount of fuel. In some

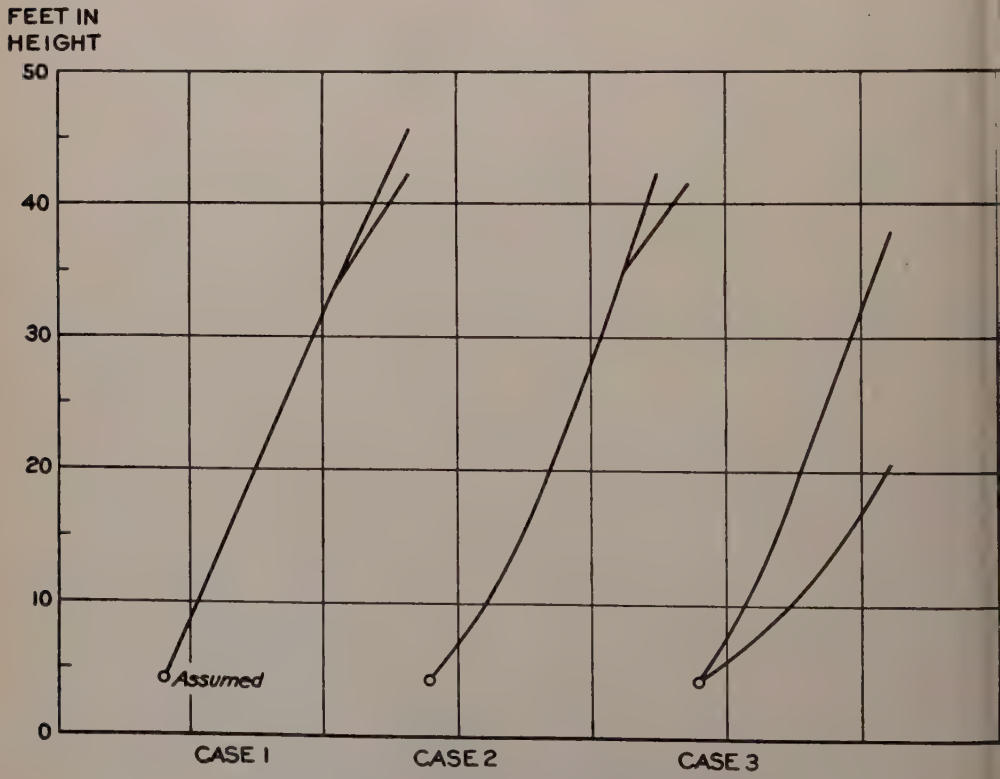

Fig. 4.—Effect of annual (winter) protective fires.

cases growth does not seem to be checked at all.

4. Young trees up to the time they are at least 15 feet high may be burned hard enough in winter to check height growth for the following year to a half or third of its normal amount, and that more than once in all probability, and yet resume the normal rate of growth the second or third year.

5. The most careful protective burning that was observed (that is to say light winter burning annually conducted with the idea of protecting areas from severe fire) checked height growth of the young timber affected by between 20 and 25 per cent.

"When this crude forest exploitation and destructive process has gone on so long that virgin supplies are nearly exhausted, that the effects of inconsiderate clearing or forest devastation becomes visible in soil washes, in high and low water stages of rivers, more frequent and more destructive floods, etc., then he begins to consider more carefully the relation which the forest and its continuance bears toward the further development of society, toward the conditions of his surroundings; he realizes that he may not continue to disturb the balance of nature unpunished, nay, that he must be active in improving the methods of nature, and weight that side of the balance which is favorable to him and his pursuits; he begins to bring more rational method into his use of the forest, he attempts to apply knowledge and care in its treatment, he makes it an object of economic thought, in other words he arrives at a first conception of and applies forestry, which may be most comprehensively defined as the rational treatment of forests for forest purposes. First he determines upon a rational policy for his further conduct toward the forest, and then, having studied the manner in which forests grow, having become familiar with the science of forestry, he develops superior positive methods in treatment and perpetuation of the forest and applies the art of forestry; and, adding the financial aspect in the application of the art, he practises the business of forestry.

"In its broadest sense thus the term 'forestry,' according to the point of view, represents a policy, a science, an art, a business."

Economics of Forestry, Bernhard E. Fernow. 1902.

SOME FURTHER RELATIONS OF FIRE TO LONGLEAF PINE

By H. H. CHAPMAN

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Professor Chapman has long studied the influence of fire on the reproduction of longleaf pine. In this article he distinguishes between (1) burning preceding seeding and subsequent complete or periodic protection and (2) complete protection before and after seeding. His experiments convince him that the ground must be freed of competing material prior to seed fall by means of fire but that annual burning subsequent to seeding is highly detrimental. His experiments on intermittent burning and protection at two- to three-year intervals after seeding and prior to the start of height growth are not completed, but they indicate some value in bringing about conditions favorable to healthy height growth.

MR. CARY'S ARTICLE in this issue, *Some Relations of Fire to Longleaf Pine,* enlarges our knowledge of the important subject of fires in its relation to longleaf pine. His study enters a field formerly neglected, namely, the effect of fire on height growth of longleaf pine stands *after* their establishment and through the pole stage. In brief, he finds that winter fires when strictly controlled as, for instance, by burning at night, may have no effect on growth, but that the cumulative effect of annual fires may reduce height growth of poles 25 per cent. The effect of fires in the juvenile or seedling stage *before* height growth commences may not reduce this subsequent height growth *after* it begins. He confirms other observations on the retarding effect upon height growth of fires in the young sapling stage especially when defoliation occurs, and emphasizes the severe and permanent injury caused by summer fires.

Mr. Cary states, as understood, the fact that enormous numbers of longleaf pine are killed by fire both before and after they have started their height growth. Care is needed here in distinguishing the effects of controlled winter fires and those burning uncontrolled.

The present writer has approached this subject from a different angle, namely, the problem of establishing natural reproduction of this species from seed. Up to the present time, as far as he knows, practically all existing stands of second-growth longleaf pine which have survived the juvenile stage and have assumed a vigorous height growth and become saplings have originated on land which *previous to the fall of the seed has not been under fire protection.* In almost every instance, these lands were formerly burned annually and sometimes twice in a single season. The effect of these repeated fires, set purposely and usually burning uncontrolled in dry and windy weather, was, if the few sample plots recorded are trustworthy, to weaken and reduce the vigor of bunch grass to a considerable degree, besides eliminating for the most part all competing pines and most hardwoods. In some instances of record, as at Bogalusa, La., and Urania, La., seedlings were established on such burned areas, and were then protected from fire, and these seedlings came through and initiated a normal height growth in from 5 to 10 years, without further burning. But this did *not* settle the question as to what would happen to seedlings which germinated on areas which had been protected from fire for a longer or shorter period *before* the seed fell. Records kept at Urania, La., began to reveal an alarming condition. To test the validity of the indications, all brush and tree competition was eliminated from certain of these plots and has been kept out for 10 years. The unmistakable

indications are, in 1931, that fire protection over a period of from 3 to 6 years *preceding* the fall of the seed results in the permanent suppressing of such seedlings as germinate in this grass sod. (A contributing factor to the result is the fungus disease, *Septoria aricola* (Thüm) Sacc., known as the brown spot needle blight, which defoliates the seedlings annually when infestation is severe, but is confined to a height zone of from 2 to 3 feet, though found scattered sparingly above this zone on saplings.) Data in substantiation of these facts are shown on the two originally unfenced Plots 3 and 4 of the four famous Roberts plots at Urania, La., Plot 3 protected three years and Plot 4 six years previous to the germination of seed in 1919, at which time these plots were fenced. On the other two adjoining originally fenced Plots 1 and 2, the 1913 crop of seedlings started vigorous height growth, in the 6th year on both the unburned Plot 1 and the plot burned annually, 2. By contrast, Plot 3 not burned since 1914, but fenced and seeded in 1919 has not produced a single developing seedling. All are permanently stunted. The presence of scattered shortleaf and loblolly pines and of brush of course aided in this result. But on the fourth plot fenced and seeded in 1919, on which fire was absent but three years previous to seeding, the period of juvenile development preceding height growth was lengthened from the normal 5 years to 11 years (or by 6 years) only two seedlings started height growth normally in the 6th year and in the 13th year, but 50 seedlings show any tendency to assume height growth and all of these are still under 2 feet in height. Fire protection for 3 years preceding seed fall, has in this case added 7 years to the juvenile stage and reduced an originally ample crop of seedlings of several thousand per acre to a maximum possible survival of 200 per acre. These results agree with those obtained elsewhere at Urania under controlled conditions. During this entire period of unnaturally prolonged infancy and of doubtful survival, hogs, if they obtain entrance will root out and devour these seedlings and have so disposed of quite a percentage in spite of efforts to keep them out. Fires set by accident in the heavy "rough" during the summer have taken their toll in spite of prompt and vigorous efforts at extinction. The writer is convinced that fire is necessary for the removal of the mulch and litter previous to seeding, if longleaf pine is to be reproduced. Before deciding that additional fires subsequent to seeding are *not* necessary to the survival of the seedlings and the securing of height growth in the normal period of 5 years, it will be necessary to do for other regions what has been done at Urania, La.—*keep fire out* on controlled areas, and see whether the species can establish itself and survive under such conditions. On the basis of existing evidence, the writer holds the belief that if complete fire protection must be enforced on the vast areas of longleaf pine lands of the South, and is successful, *the longleaf pine will disappear as a species.* Since there are as far as known no permanent plot records except those established at Urania by the writer, and the two above mentioned Roberts plots (which were abandoned by the Forest Service after hogs destroyed the 1913 seedling crop) on which records have been kept for 15 years *on land protected previous to seed fall,* confirmation of these experimental results by other investigators will take some time.

Meanwhile, in order to avoid losing further time in solving the problem thus presented, it was necessary to begin experiments with controlled burning intended to bring about favorable conditions for securing healthy height growth in the demonstrated period possible, namely, 5 years. The *annual* use even of controlled fires, if begun *after* the first spring, or when the seedlings had had one summer's growth, has been shown on the two Forest Service

Roberts Plots Nos. 1 and 2 and elsewhere to be determined to height growth but not a complete barrier to survival. However, the annual defoliation of these seedlings does kill a large number especially in dense stands and did not appear to be the solution of the problem. It occurred to the writer that the seedling might find the optimum condition for survival and initiation of height growth if fire could be used at longer intervals of say 2 to 3 years. The retention of the needles for two growing seasons instead of one has in many observed instances produced a great increase in vigor of height growth. In annual fires the material stored in the root upon which the seedling depends for its new crop of needles after a defoliating spring fire, is drained for this purpose, while if the last year's foliage is still functioning, the plant is greatly invigorated. In another way it appeared that this alternation of fire and protection might work out well for the seedling. It was observed at Urania that on protected areas the brown spot disease was very severe in its defoliating effect while in every observed case it was practically absent from an area during the summer following a winter fire. It might be that a practical control of this disease in nature consisted of these periodic burnings. This procedure was suggested in Yale Forest School Bulletin 16 published in 1926, but its application at Urania has to await a seed year.

As no agency known to the writer was then conducting planned experiments on 2- or 3-year rotation burning, Mr. Henry E. Hardtner consented in 1928, preceding the seed year of 1929, to permit experimental burning and plots were established at Urania to try out the plan. The original conclusion as to the effect of complete protection having taken 17 years to establish conclusively, it is too much to expect that the plan of rotation 2- to 3-year burning can be tested on permanent sample plots short of another 10-year period. Meanwhile, duplications of this experiment have, in 1931, been inaugurated by the Southern Forest Experiment Station near Lake City, Florida, and more are planned at Bogalusa, La. At the latter place, seedlings established on land that had received *no previous fire protection* came out of the grass in from 7 to 10 years in spite of the brown spot disease. Similar results were observed at Urania, La., in the Greeley pasture.

Meanwhile the usual efforts can be made to approximate the facts by observations and measurements on temporary plots whose history is not a matter of scientific record. The results of such a study, covering 41 measurements has been presented by the State Forest Service of Mississippi in which the conclusions are drawn, that "*in the complete absence of any experimental data concerning periodic burning,* many general observations and single instances can be cited to indicate that the above is largely *pure theory*"!

The status of this investigation therefore seems to be as follows: The fact that longleaf pine reproduction will be progressively rendered impossible by complete fire protection preceding seed fall is established by scientific record at Urania and appears to be confirmed by observation elsewhere, made by the writer. The theory that rotational 2- to 3-year controlled burning may solve the problem of reproduction thus presented awaits scientific confirmation and will *not* be settled by observations alone in the absence of permanent historical records. The writer aided by Mr. Hardtner is endeavoring to solve this problem and to stimulate others to aid in solving it. (In at least one case the stimulus has resulted in action.) While fully aware for the past 20 years of the economic and administrative significance of the problem the writer believes that the facts must be determined whatever they are. In the words of Mr. Cary, "Practical inferences to which they may lead will not be stated," at least in this article.

RELATION OF FIRES TO WATER CONSERVATION IN LOS ANGELES COUNTY[1]

By E. C. EATON

Chief Engineer, Los Angeles County Flood Control District

Engineers and foresters are at variance as to the value of a watershed cover for water conservation and for the control of storm damage. However, Mr. Eaton, an eminent hydraulic engineer and in charge of what is perhaps the largest single water conservation and erosion control project in the world, believes that vegetation covering the watershed surfaces is the most valuable ally of the engineer, and that artificial works simply supplement the natural cover for the control and conservation of water. This declaration suggests that foresters and engineers should work together in water conservation problems. This brief paper covers a large field of study and represents a series of conclusions of more extensive investigations.

FIRES AND their bearing on water conservation have such a close relationship in our mountain drainage areas that it is of the utmost importance that all possible means be taken towards their complete control. The relationship is of such importance that the absence of fire denotes the increase of water conservation while the occurrence of fire practically eliminates such conservation. There are two possible means of water conservation. That provided by nature, and that provided by man and both are seriously affected by fires.

In the State of California nature has prodigally given cover to the majority of the mountainous areas, either in the way of tree growth such as occurs in the northern parts of the state, or in chaparal growth which covers the mountain ranges of the southern counties. However, man has caused the depletion of this original heritage through destructive logging methods and carelessness in the matter of fires and their control, so that today we are face to face with a problem that faced China many hundreds of years ago, and one that, if met with no more of a correcting policy than the Chinese used, will result, in time, in a situation very similar to that country's at the present time—a high mountainous back country devoid of cover, creating at intervals floods of great destructiveness to the populous plains areas, accompanied by sterility of eroded slopes and debris-covered valleys.

That mountain vegetation, whether of an herbaceous nature such as covers grazing areas, brush cover such as grows so densely over the Sierra Madre Mountains, or heavy tree growth such as occurs on the western slopes of the Sierra Nevada Mountains, acts as the most efficient and effective means of water control and conservation, is a fact that has been established beyond question.

Man's works of conservation, such as dams and spreading grounds are supplementary to nature's methods of conservation, and from the standpoint of economics are dependent upon the efficient functioning of natural conservation through mountain vegetation.

Where artificial works can only be placed in stream channels, and control can be obtained equal only to the capacity of such works, the natural cover of vegetation applies those same principles of retardation, storage and percolation to

[1]Presented at the 4th annual meeting of the California Section, Society of American Foresters, at San Francisco, Calif., December 18, 1931.

the entire area that artificial works afford to a limited extent.

The action of vegetation in these respects is accomplished by the following means:

1. The rain falling on vegetation loses its impact before reaching the soil, and thus reduces erosion.

2. A certain amount of the rain itself is intercepted by the vegetation before it reaches the ground which reduces both erosion and run-off.

3. The root systems absorb a portion of the moisture in the soil before a rain, thus allowing a greater percolation capacity than would otherwise be possible.

4. The vegetation increases the humus content which in turn increases the porosity of the soil and results in a greater percolation and holding capacity.

5. The vegetation spreads out the run-off by the interposition of leaves and stems, which results in less erosion and run-off than would otherwise occur. The debris of dead vegetation furthers this action by piling up against the live vegetation, thus acting on the principle of minute check dams and terraces.

6. The leaves and stems of vegetation tend to reduce the soil material content in water which increases its ability to percolate into the soil.

7. The root systems of vegetation tend to bind the soil together which reduces the amount of erosion taking place.

Los Angeles County has about twenty-five of the larger watersheds of Southern California ranging from 200 to 25 square miles individually but has many hundreds of small watershed areas ranging from 1 to 5 square miles each.

On the larger watersheds flood control and conservation requires artificial structures such as regulating dams in addition to the protection afforded by the natural forest cover. In the smaller individual watersheds of from 1 to 5 square miles each, the treatment for flood protection and conservation is more difficult and very expensive, and in these cases, as a practical matter, dependence must be largely placed upon preservation of the natural cover as being the best and most feasible solution of the problem.

The Flood Control District maintains an emergency fund under which check dams can immediately be constructed on such an area which has been denuded by fire, but the fullest possible number of such structures cannot duplicate the protection afforded by the natural vegetation. This is particularly true where "sheet erosion," or land slips, from large areas may occur.

On a burned-off watershed it is not uncommon to have 25,000 cubic yards of debris from one square mile of burned-off area. This is equivalent to about fifteen and one-half acre feet. When it is realized that the average cost of providing storage in our mountains is over $200.00 per acre foot, the economic importance of preserving the natural cover to prevent the filling up of valuable storage space is evident.

Fire, one of the most destructive forces to all vegetation, can immediately turn a natural water basin of vegetation—covered slopes into an area whose potential possibilities of damage and destruction if a heavy rain follows, are only limited in extent by the values of real and personal property below the outlet.

The removal of debris from our streets and roads, including the hauling away averages $1.00 per cubic yard.

The district estimates that within the areas not now fully protected there lies property valued at $300,000,000. The extent to which this property is subject to destruction will depend not only upon the amount and rate of rainfall in a major storm but also upon the condition of the watershed cover. A major amount of destruction will occur should a major

flood happen within two years after a major fire.

That the run-off increases following a severe fire and water percolation and conservation decrease is well evidenced by many experiments and field observations. The results of an experiment conducted by the California Forest Experiment Station on a chapparal-covered plot and on a burned-off plot located in the San Bernardino National Forest showed that during the season of 1927-28 the ratio of run-off from the brush-covered plot to that from the burned-off plot was 1 to 3.7. This ratio however, during a storm of 4.34 inches, when a maximum rate of rainfall was reached, amounted to 1 to 66.5. The rate of erosion was also determined to be 1 for the brush-covered plot against 18.1 for the burned-off plot.

An experiment conducted by the Los Angeles County Flood Control District this year on a model watershed of an area at first covered with brush and then burned-off gave, for a rate of rainfall of 1.36 inches per hour, a run-off equal to 0.42 inches per hour for the brush-covered area and 1.01 inches per hour for the burned-off area, a ratio of 1 to 2.4. The rate of erosion for the brush-covered area was 400 cubic yards of debris per square mile against 12,000 cubic yards of debris per square mile for the burned-off plot after an hour's run, a ratio of 1 to 30.

That a severe fire on even a very porous-soil mountain area can produce damaging floods is evidenced by the storm of 1914 and its effect on Haines Canyon, in the Sierra Madre Mountains. In 1913 this watershed of 1.2 square miles was burned over very severely. The ashes filtered down and sealed up the pores and fissures in the ground.

Thus artificial measures taken by man to conserve water are, because of the vast detrital flow following a severe burn, susceptible to rapid silting up and covering over with a consequent loss of effectiveness. Every dollar expended for water conservation works is therefore jeopardized by fire.

Spreading grounds as a method of conserving flashy peak flows and returning them to the vast underground basins in our alluvial plains has been adopted by many conservation bodies as the cheapest and most efficient way that man has yet devised of building up our water table. The principle of spreading grounds is based upon the ability of these alluvial deposits to absorb water at a feasible rate of percolation. The average run-off from brush-covered mountain areas is free enough from silt by the time the water reaches the spreading grounds so that percolation takes place by keeping the water moving enough to scour the channels of the spreading system. The immediate and great increase in detrital matter brought down following a severe burn could not be taken care of before reaching the spreading grounds. The result would be any immediate clogging up of the openings in the surface of the spreading grounds and a consequent reduction and eventually complete elimination of any percolation.

Any one, therefore, who is interested in water conservation should be vitally interested in protecting to the utmost the most valuable ally we have to the conservation of our water supply—our chapparal- and tree-covered slopes.

THE EFFECT OF FOREST FIRES ON TOURIST TRAVEL[1]

By T. L. STANLEY

General Manager, Shasta-Cascade Wonderland Association, Red Bluff, Calif.

An influence of forest fires not usually reckoned with is their negative effect upon the tourist business. Tourists shun areas that are smoke-filled with consequent loss of enjoyment and inspiration to themselves and a heavy reduction of business to those engaged in catering to their needs. Mr. Stanley has had an unusual opportunity to note the relation between forest fires and the volume of tourist traffic. What he reports for California is doubtless true in other regions where fires are prevalent.

TOURIST TRAVEL today is a commercial business totaling approximately $3,000,000,000 annually for the United States and every state and every community is trying to attract and develop its share of this business. Areas that are rich in comfortable climate and distinctive scenic attractions have a great advantage over others for cultivating tourist trade. If a region be rich in natural attractions it may even permit itself to be shunned because of the carelessness of its people or the unfriendly habits they develop.

The Pacific Coast is rich in its natural advantages for attracting tourist travel. It has a comfortable climate, a great variety of scenery and a romatic charm that draws from far and wide. Smooth highways are being constructed into all parts and good roads and trails reach the most inaccesible places. Tourist travel has increased tremendously during the last few years. Much of the increase is due to extensive advertising campaigns conducted by "Californians Inc.," the "All-Year-Club" of Southern California, the "Puget Sounders," "On to Oregon" and other similar organizations. For instance Californians Inc., reach 150 million people every year through their advertising which costs about $500,000 per year. The All-Year-Club spent last year $1,200,000 on various sorts of advertising. This advertising it will be seen costs millions of dollars and it is voluntarily contributed by business men who recognize the value of the trade.

The tourist dollar is a new dollar because it usually comes from outside the territory in which it is spent. One of the greatest advertising features recognized by all advertisers whether it be selling scenery or other merchandise, is to have a satisfied customer. One of the biggest programs that tourist advertising groups put on is that of keeping the customer comfortable, happy and satisfied. A satisfied tourist means money to the entire community and this money eventually finds a division among all its members.

A study of the distribution of such money has been made on an account of 7,115 guests at one hotel. This is how the money from these guests was distributed throughout the community:

Valet service	$ 151.25
Laundry (guests' laundry only)	310.00
Milk and butter	888.00
Eggs	140.00
Meat	1,100.00
Fruit	740.00
Vegetables	750.00
Bakery goods (does not include pies)	330.00
Ice cream	260.00
Water	210.00

[1]Presented at the 4th annual meeting of the California Section, Society of American Foresters at San Francisco, Calif., December 18, 1931.

Oil and gas, and electricity	700.00
Telephone	570.00
Poultry	725.00
Fish	480.00
Salaries and wages (about $1.00 per guest)	7,000.00
	$14,354.25

The above figures do not include the taxes paid to the county government nor the amount of money for the hotel laundry, but it will be seen that each guest paid approximately an average of $1.00 a day in purchase of home produce. A tourist is thus really an asset to the community in which he stays.

Then again if we analyze the budget of the tourist we find that 12 per cent is paid out in gasoline, oil, etc; 26 per cent is paid for merchandise; 10 per cent for local transportation; 8 per cent for amusements; and 10 per cent for incidentals. Much of which again finds its way into the pockets of the community

These tourist dollars represent not merely a dollar here and there but the business has grown to enormous proportions in California. Approximately one million people came to the state in 1931 by automobiles and by railroad. These figures have been given out by the State Chamber of Commerce and the Southern Pacific railroad. According to Californians Inc., who have made an extensive study of this travel, people spend an average of $331.00 each while in the state, which makes a total of $331,000,000 new money.

It is estimated that 80 per cent of the people of California spend 10 days on a vacation each year; and each day while on that vacation they spend $5.00 per person. If we are to accept these figures and estimate the income from this source alone we find a great local tourist fund. The population of California is 5,672,000, 80 per cent of which would be 4,537,600, and on the basis of a 10-day vacation at $5.00 a day would create a total expenditure of $226,880,000. This would bring the total for the state up to $557,880,000 per year. We still have the steamship and air travel not included in that amount.

Compare this income from travel to the yearly income from agriculture based on the crops of 1923, 1925, 1927, all good years, which brought in $452,000,000, or to that of live stock for the same three years which brought in $178,850,000 or to mining for the same periods which brought in $381,775,000; we might also compare it with the greatest gold year on record in 1852 when the output was $81,-294,700 and we still find that the tourist "crop" in California maintains the top position.

The problem of all organized effort in trying to secure more of this business is what to do in order to attract and hold the tourists travel. With an organization like the one which I represent it is no wonder that of all the problems we have found we consider the problem of forest fires with grave concern.

In order that we might have the benefit from the experiences of others we have made a survey of the effect of forest fires in other places as well as in our own region. We have made some rather startling discoveries.

Last season the Trinity Alps resort located in Trinity County suffered a loss of from 50 per cent to 60 per cent for a period of three weeks while fires burned some 35 miles away in another section of the Trinity National Forest.

We find that in the Shasta National Forest in 1926 there were 240 fires in the Sacramento Canyon and that during that time the tourists were in the habit of getting up in the middle of the night to leave their hotels and resorts to get out of the supposed danger. No tourist is likely to return to a place where that has been his experience.

An excellent example of fire and smoke upon recreational travel occurred at the

time of the dedication of the Lassen Volcanic National Park last summer. This dedication was heralded as one of the outstanding events of the season in the northern part of California. It was advertised extensively in every possible way. Perhaps no other similar event had ever received so much publicity; excellent articles and pictures were published in magazines and papers. One could not travel the highways without seeing some reference to the dedication; spectacles that were advertised were of outstanding character. The number of prominent people who had signified their intention of attending the exercises would have ordinarily drawn large crowds in themselves. It was safe to expect that there would be a large crowd in attendance for the three days of July 24, 25, and 26. However on July 20 a fire started about 20 miles south of the main road, it grew into a large fire and smoked up strong during and until a few days after the dedication. At no time had the fire threatened the park nor any of the roads leading to it but the fact that the fire was burning in that region caused some of the prominent people to cancel their engagements and reservations, so, instead of a large crowd attending the dedication as was expected by those handling the celebration there were less than 6,000 checked into the park on the three days of the dedication. This represented probably 7 per cent of the population within 2.5 hours of the park entrance.

So serious has this matter become that the California State Chamber of Commerce formed a committee which works very closely with the newspapers to see that they do not give any undue publicity and headlines to minor fires. Colonel Thompson, Superintendent of the Yosemite National Park, tells us that in serving on this committee he has succeeded in securing the help of the newspapers in eliminating headlines that involve a national park in a forest fire.

Another case in point: Dr. Don Tressidor of Yosemite Park tells us that last season the King of Siam and his party had made reservations at the park during their stay in California, but upon their arrival at Fresno it was reported that a fire was burning on the Wawona road and without checking the matter cancelled their reservations.

One of our important state highways suffered a loss of 50 per cent in travel for a period of 5 weeks this past summer because the road had been blocked for a period of three days during a fire in a national forest in which a man had been burned to death.

The cause for much of this disturbance of tourist travel may be said to be:

1. Fear of being drafted to fight fire, a thing that is seldom done except in an emergency. Our experience with tourists have shown that they always ask about fire before going into a forest region.

2. There is no pleasure in visiting a spot or stopping over in a country filled with smoke. Judge Alex Sparrow of Medford, formerly Superintendent of Crater Lake National Park, used to say that no one would come to Crater National Park during forest fires "to look down into a hole filled with smoke."

Not only do tourists fear being drafted or complain that there is no pleasure in looking at smoke-covered hills, but most of them "carry away enraged sentiments that will keep them and others from returning."

People who come to California as tourists look for big outstanding things either favorable or unfavorable to talk about when they return to their homes. For some reason they are inclined to overemphasize what they saw and heard. For example—an eastern woman in Yreka was heard to tell about rattlesnakes out in the lava beds of Modoc County which

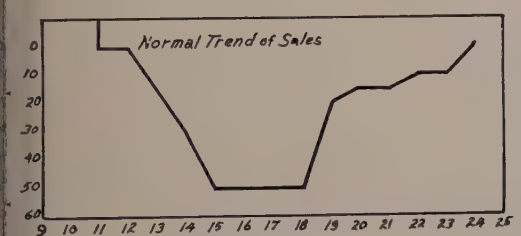
were 18 feet long! Another easterner returned home and told that all of California was being burned by incendiaries. These illustrations and arguments which have been taken from among many are very convincing that forest fires *do* have a bad effect upon tourist travel. But figures compiled from a recent study are still more convincing. In order that we may compare these figures they have been reduced to graphs.

The graph in Figure 1 shows the effect of forest fires on recreational travel along the Redwood Highway in 1929. On September 11 business in gas stations, restaurants, etc., catering to tourist travel was 10 per cent above the normal trend of scale. On that date fires started at Richardson's Grove, Bull Creek Flat and in Mendocino County and by the 15th business had dropped to 50 per cent below normal where it remained until the 18th when one of the fires was reported out and the others under control. It took until the 24th until the business was again back to normal. The exact figures are:

September 11th — normal
September 12th — normal
September 13th — off 15 per cent
September 14th — off 30 per cent
September 15th — off 50 per cent
September 16th — off 50 per cent
September 17th — off 50 per cent
September 18th — off 50 per cent
September 19th — off 20 per cent
September 20th — off 14 per cent
September 21st — off 14 per cent
September 22nd — off 10 per cent
September 23rd — off 10 per cent
September 24th — normal

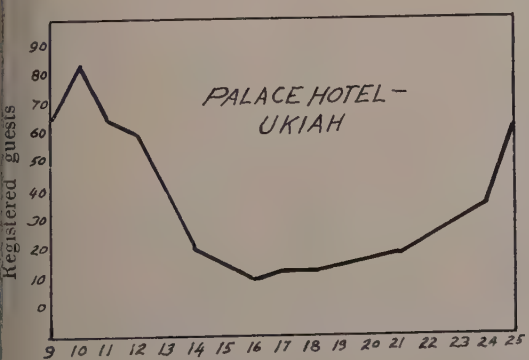
What was the effect upon the hotel business down the line out of range of the fires? On the 11th, or the day the fire started, there were approximately 65 registrations in the Palace Hotel in Ukiah, the registrations dropped until the 16th when there were but 10 and it took until the 25th before the registrations were up again to where they were before the fire started. The exact registration was:

September 9th — 64 guests
September 10th — 85 guests
September 11th — 65 guests
September 12th — 60 guests
September 13th — 41 guests
September 14th — 20 guests
September 15th — 15 guests
September 16th — 10 guests
September 17th — 12 guests
September 18th — 13 guests
September 19th — 15 guests
September 20th — 17 guests
September 21st — 18 guests



September, 1929.

Richardson's Grove Fire
Bull Creek Flat Fire
Mendocino Co. Fires



September, 1929.

Fig. 1.—Effects of forest fires on business in the "Redwood Empire" (gas stations, restaurants, etc., catering to tourists).

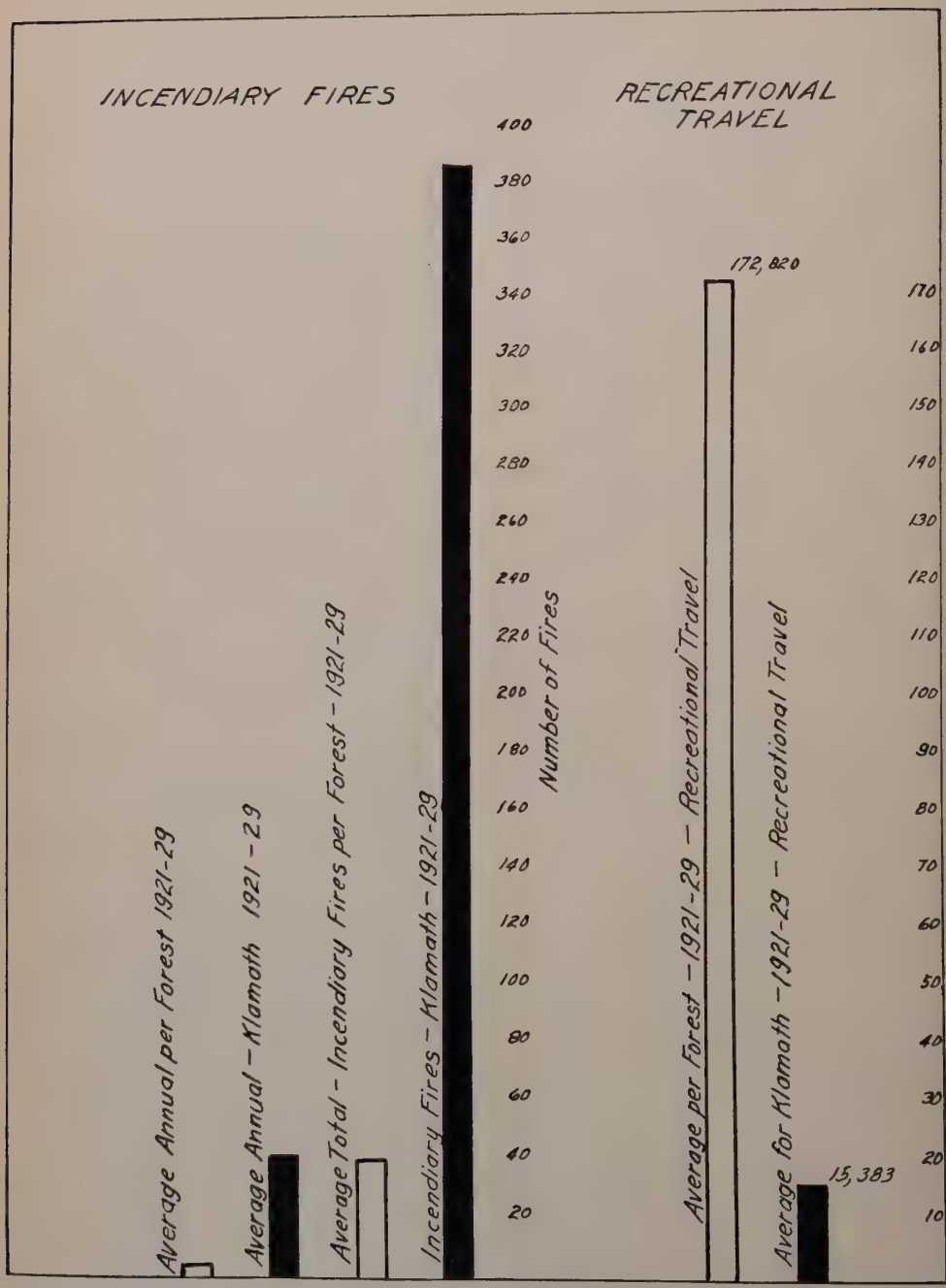


Fig. 2.—Relation of incendiary fires to tourist travel in 12 northern California forests as compared to Trinity National Forest.

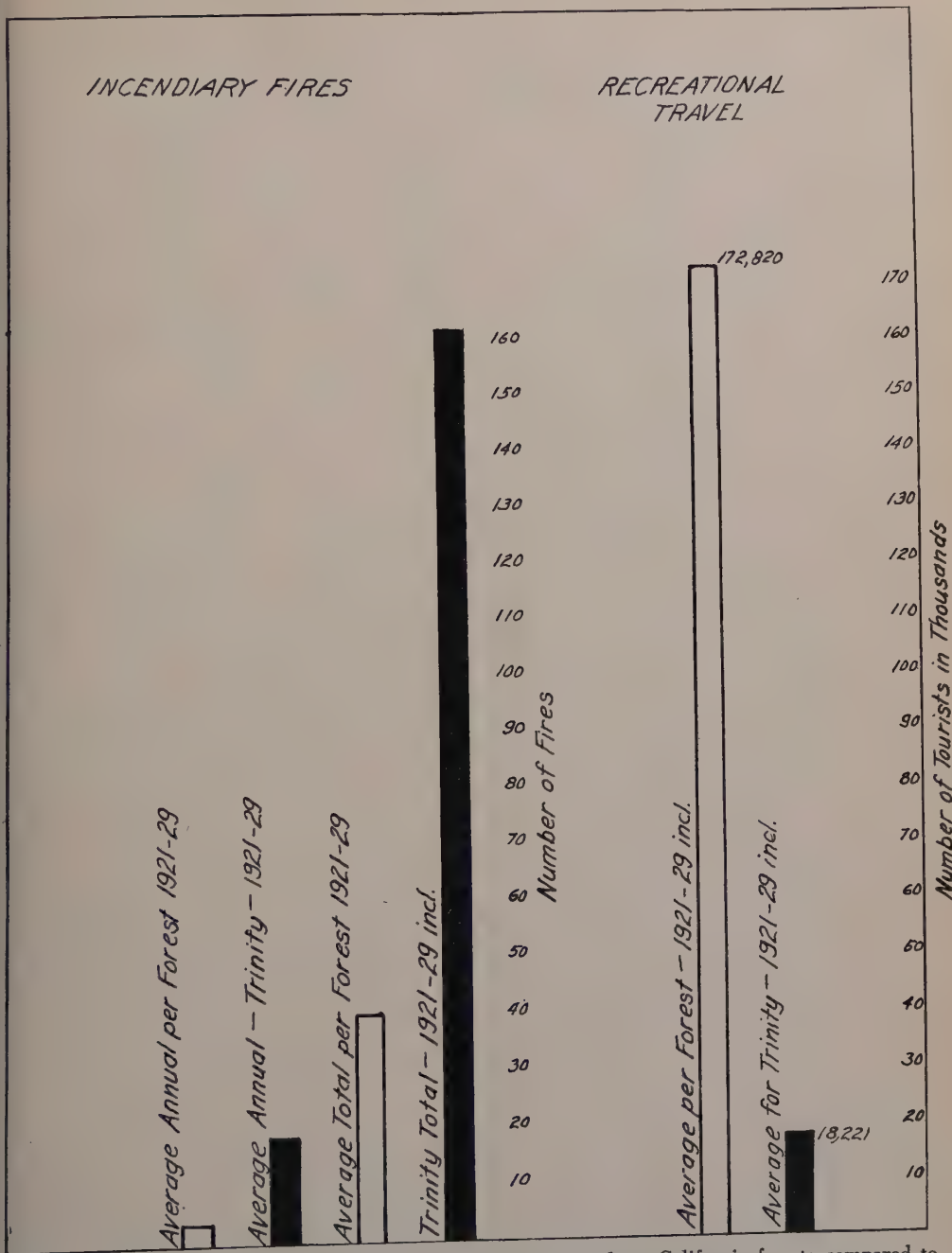


Fig. 3.—Relation of incendiary fires to forest travel in 12 northern California forests compared to Klamath National Forest.

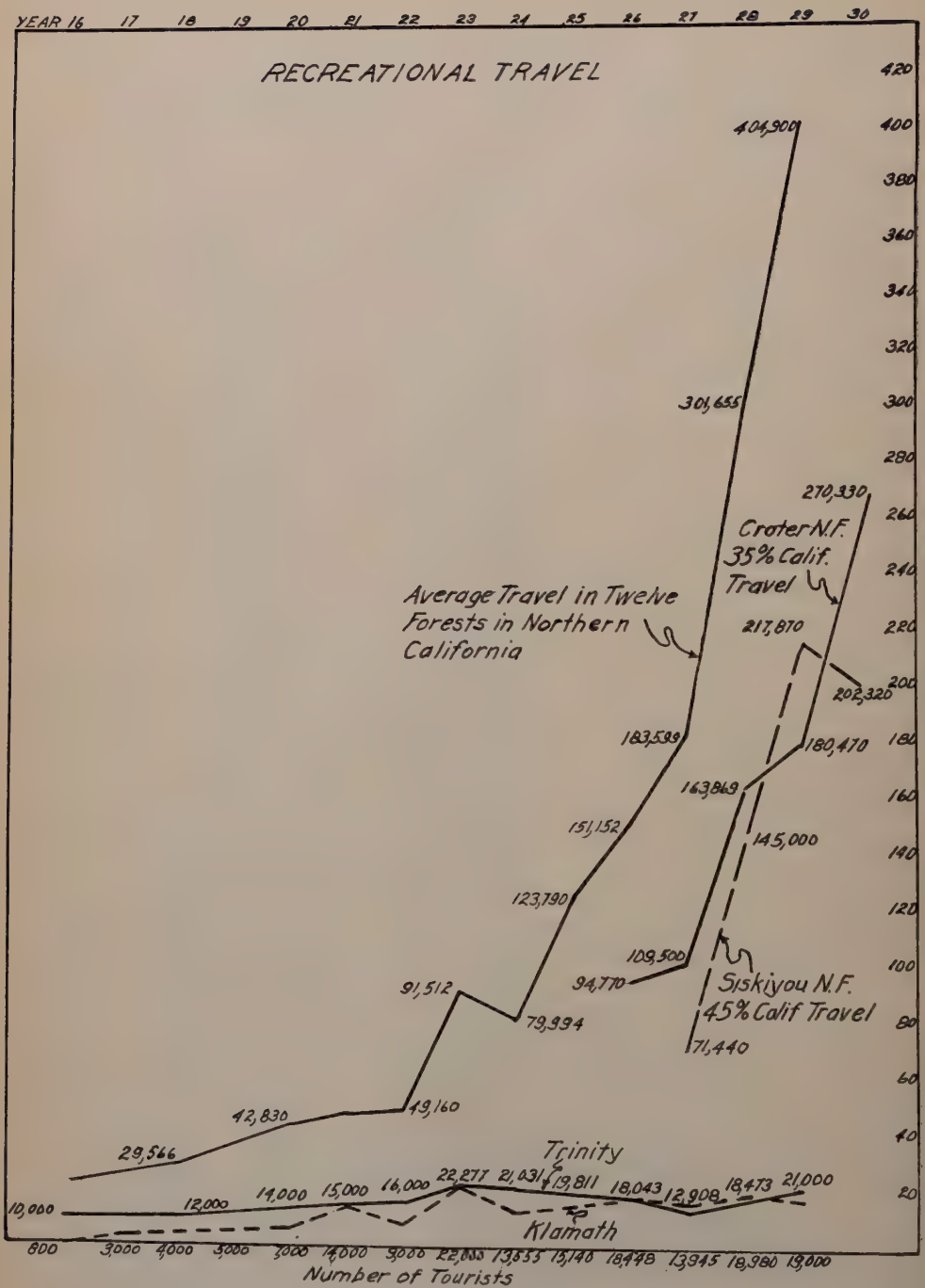


Fig. 4.—Growth of tourist travel in 14 national forests of California and Oregon

September 22nd — 24 guests
September 23rd — 30 guests
September 24th — 35 guests
September 25th — 60 guests

During this same period the business men of Eureka reported a similar decrease in their business during the time the fires were burning. There is no doubt that during the past summer while there was a much advertised forest fire along this highway that there was a similar loss to business but we have not had an opportunity to study this matter.

The graphs in Figures 2 and 3 show the relative number of incendiary fires in the 12 national forests of northern California in comparison with the Trinity and Klamath forests which are the two having the heaviest record of incendiary fires. It will be noted that the average annual number of fires for the forests between the years 1921 and 1929 was four, the average annual for the Trinity forest during the same period was 19 and for the Klamath, 21. The total per forest for the 8 years for the 12 forests was 40 while the Trinity total was 160 and the Klamath, 384. It is interesting to note that the number of persons visiting those of the 12 forests whose number of annual incendiary fires was very low, was 172,820, while the average for the Trinity, where the number of incendiary fires was high, was 18,212 and for the Klamath was 15,383.

The graph in Figure 4 shows recreational travel in numbers since 1916 in the 12 forests of northern California and two of southern Oregon. The two in southern Oregon are the Crater and the Siskiyou. Crater received 36 per cent of its travel from out of California and the Siskiyou received 45 per cent of its travel from California. It will be noted in this graph that since 1916 there has been a constant and continuous increase in tourist travel in these forests as compared with the very slight increase in the travel into the Trinity and Klamath forests, where incendiary fires were common.

From these opinions, figures and graphs, there seems to be only one conclusion. Forest fires *do* damage travel causing discomfort and uneasiness among tourists and heavy losses to those business concerns organized to serve travelers. This loss would also seem to be much greater than the immediate devastation wrought by the fire itself. In many cases fires have wiped out pleasant recreation areas beyond recovery in the minds of the tourists who leave the areas for those kept free from fires and their indelible imprint.

For this reason the Shasta-Cascade Wonderland Association has as one of its objectives "Keep the Recreational areas free from fire and smoke during the Recreational season."

SOME PRELIMINARY STUDIES TOWARD THE DEVELOPMENT OF A STATE FOREST FIRE PROTECTION POLICY[1]

By BURNETT SANFORD

Forest Technician, State Division of Forestry, Sacramento, Calif.

The mounting cost of forest protection, the conflicting sentiments of local people as to the propriety of keeping out fires, and the realization that state funds should be expended only for the protection of those resources that have state-wide value, have led California's state forester to initiate a survey to determine what areas should be given protection and to what extent. Mr. Sanford, who is making the survey, tells here of the first steps and problems that have already engaged his attention.

THE present California State Division of Forestry started as an investigative board organized in 1885, it was given police powers in 1887 but was allowed to stagnate until 1905, when due to the efforts of Governor Pardee, the first state forest policy was determined upon and enacted in the form of a bill. The office of State Forester was established at this time and the next few years saw the appointment of voluntary fire wardens and the obtaining of coöperation from several counties in the form of funds for the employment of fire fighters.

The World War established the necessity of fire protection for all resources and in 1919 the first appropriation for the formation of a fire-fighting organization became available. This first biennial appropriation of $25,000 has been regularly increased until in 1931 $350,000 was appropriated. This sum has been augmented by coöperative funds from federal and county agencies. Starting with the necessity of war-time protection the state's forces have spread their protection over practically all property outside of municipalities within those counties where state organizations function. This rural protection of personal property has met with local approval and has been the primary purpose of the various county boards of supervisors' coöperating with the state forester. This local demand for protection of the resources of high value has forced the state protective organization to concentrate its forces in the more thickly populated areas and spend a large portion of its suppression time in the valleys.

I have been employed by the State Forester to make a survey of the state to determine the location of those resources which may be classed as having a state-wide value. My first problem has been to define the term "state-wide value." Every resource which adds to the wealth of the state has to some degree state-wide value. As an employee of the Department of Natural Resources I shall consider only those values which exist without the aid of man. This classification reduces the field to water, recreational areas, fish, game, timber and uncultivated forage. There are others but these six are the ones which directly concern the forester. Immediately the first four, water, recreational areas, fish and game, are recognized as having state-wide value through their wide-spread use and limited area. The local communities can not be expected to protect such resources for the benefit of the people from distant regions, where the cost of protection is in most cases far in excess of the local value. The protection of these resources is clearly one of state- and nation-wide importance.

[1]Presented at the 4th annual meeting of the California Section of the Society of American Foresters at San Francisco, Calif., December 18, 1931.

The remaining two resources, timber and forage, unfortunately are not so easily classified. As area of privately owned merchantable timber is subject to exploitation at any time and as long as the public has a plentiful supply of forest products it is of little state-wide value. The maintenance of a continuous supply of forest products is of state-wide and national importance. Until we are able to determine what area of timberlands will be required to meet the nation's future needs it would seem to be good public policy to encourage the conservation of the present available supply. Protection from fire is one of the greatest problems of the timber owner and any assistance which the state can render is an aid toward conservation and should encourage management for a sustained yield.

In the pine region legislation has been enacted which places the state on record as an interested party in timber conservation and places the responsibility of protection from fire upon the land-owners. The federal and state protective organizations have voluntarily assumed a portion of this responsibility by contracting the protection of timberlands at a nominal cost to the owner. This policy automatically places pine timberlands among the resources of state-wide value.

In the redwood region a very different condition exists. The use of fire in the woods has been legalized in the same legislation which prohibits its use in the pine. Most of the owners of redwood timber consider fire beneficial for the protection of mature timber and a necessity in the operating area. Still, both the state and federal governments are spending money to prevent and control fires in the region. If fire is beneficial in the redwood forests why is the public spending money on its suppression? If fire damages the redwood forests, why legalize its use? I am unable to answer either of these questions and fail to see the equity in the state's giving free protection to timber where fire is legalized, and charging for protection where fire is recognized as detrimental to the public welfare.

The sixth resource, forage, presents the most serious problem due to the fact that its utilization is frequently in conflict with the recognized public policy. The more fertile grazing lands have been or are rapidly being cultivated with the development of our water resources. The stockmen believe that fire is beneficial to the remaining brouse ranges but value highly the protection afforded their improvements and grass areas by the State Forester. In many instances the brush areas are of state-wide value as watershed protection, frequently adjoin areas of high timber value, and afford protection to our game. This condition results in a serious conflict of uses which is going to be the most difficult problem the State Board of Forestry has to face in the establishment of a state protection policy. Range lands are certainly of no greater state-wide value than timber lands but we are giving them protection at a high cost to the state; at no direct cost to the owners and frequenly in opposition to the interests of their owners.

In Butte County this past season the local ranger fought 196 fires, excluding false alarms and fires confined to buildings. Only 28 per cent of these started in areas which were of state-wide value as watershed, recreational areas or timber lands. Out of a total suppression expenditure of $32,000, $16,000 was spent on fires starting in areas of state-wide importance. If local organizations had controlled the fires starting in the valley proper the state's forces could undoubtedly have controlled these 55 fires at a lower cost and with a reduction of burned acreage. Until local protective organizations are effective or properly located firebreaks are available it is going to be diffi-

cult to protect the timber and brush areas of the foothills and mountains.

If we define natural resources of state-wide value as those which are of direct benefit to people in distant localities they can be classed as follows:

1. Resources which can be used by all of the people.

Recreational areas.

Fish and game areas and refuges.

2. Resources which are directly beneficial to limited but often distant areas.

Watersheds of important streams.

3. Resources which are at present of local importance but may be expected to assume state-wide importance.

Areas capable of producing merchantable timber and not adaptable to higher uses.

All of the above resources are of such a character that in most instances it would not be equitable to place the responsibility for their protection upon local communities and none are at the present time insurable for anything like their public value.

After determining, in a general way which resources are deserving of the state's protection, it is necessary to locate and bound them on the ground. To do this in detail would prove a difficult problem due to the wide variation in degree of importance.

The value of a recreational area depends more upon its accessibility to centers of population than upon the character of the area. Mt. Diablo has been acquired as a state park but Mt. Diablo in the vicinity of the Yosemite Valley would probably escape notice. About the only guide at the present time is the degree of use and probable future treatment by owners. The whole redwood region is of high recreational value but only a small portion is likely to remain permanently in this state.

In most instances the game will probably have to depend upon areas protected for other reasons except where refuges have been established.

Our present knowledge of forest influences does not enable the forester to draw definite protective boundaries around those portions of a watershed which should receive a particular treatment. There are many variables entering into the problem such as intensity, character and amount of precipitation, character of the soil, slope and cover which must be considered in detail and then, our limited knowledge will not allow the proper quantitative evaluation of all. I am working on the premise that fire is detrimental to any watershed in a mountainous country and that the lower limit of a vulnerable watershed is at the point where the water is impounded or taken from the stream bed. In most instances I find constructed or contemplated reservoirs as guides. The relative importance of the various streams has been determined by engineers and the forester may be guided by their reports in distributing his efforts.

The areas capable of producing stands of merchantable timber are for the most part readily located by the character of the timber now on them or by the character and amount of stumpage that has been removed.

Fortunately for my work most of the areas to be protected support more than one resource and it is not proving such a difficult matter to sketch on the map a boundary which will include a great proportion of the state-wide values. I am using the type map prepared by the forest experiment station for my basic data, transferring this to a new base map prepared by the State Engineer on a scale of four miles to the inch. With this type map I am able to go into the field and locate the resource boundaries.

It is going to prove a much more difficult matter to limit our protection to such designated areas. The two serious problems which the State Board of Forestry

will have to face are: First, finding some means of controlling the fires which come on to the protected area with a wide front, and, second, settling the existing conflict of uses between the local owners and the public. As long as the people in a locality believe that fire is beneficial the protection of any resource will be difficult and costly. When the forester is able to convince them that their community will be better off without fire the problem of protection is to a large part solved.

I find that the people of northern California are far from being convinced that brush and timberlands should be protected. Water conservation means little in their localities, "light burning" in the forests is far from being a dead issue, and the effect of fire on recreation is just beginning to awaken some interest. We have sold the idea of protection in the south through water conservation but we have no such lever to swing public opinion in the north and the necessity of brush field protection in localities where water is not an issue is going to be mighty difficult to prove.

"There is a regulation adopted by the Great Khan, that is ornamental and useful. At both sides of the public roads he causes trees to be planted, of a kind that become large and tall, and being only two paces asunder, they serve—besides the advantage of their shade in summer—to point out the road—when the ground is covered with snow. And this is of great assistance and affords much comfort to travellers. This is done along all the high roads, where the nature of the soil allows. . . . . He also appoints officers of rank, whose duty it is to see that all these are properly arranged and the roads constantly kept in good order. Besides the motives that have been mentioned it may be added that the Great Khan is the more disposed to plant trees because astrologers tell him that those who plant trees are rewarded with long life."

From *The Travels of Marco Polo,* (Boni and Liveright, N. Y.).

FOREST PRODUCTS RESEARCH

By FRANK P. CARTWRIGHT

Chief Engineer, National Lumber Manufacturers Association, Washington, D. C.

The manufacturer of lumber and lumber products does not have as full control over the properties of his material as does the producer of shapes and products in materials like steel, ceramics and concrete. He must take wood as nature gives it to him and can vary its properties only between relatively narrow limits. The author, with much experience in the problem of keeping wood in favor as a construction and industrial material, recognizes its limitations but is hopeful that, through a better knowledge of its properties and uses based on research, and a modification of our conservative attitude toward it, wood will not continue to remain on the defensive.

THE FOREST, as a natural resource, has reached a crisis in its history. Either it will become increasingly a winter silence and a summer playground, or it will combine these desirable aspects with growing utility, to become our universally and only renewable, and therefore our most valuable natural resource.

Much of the forest research up to date has had to do with the "nature of the animal," how it grows and where it grows, how much there is of it, and how it can be protected from its natural enemies. What kind of trees are in it, and their properties; what is wood, chemically and physically, and how does it act under different circumstances.

A wise foundation, and one that will become more and more useful as time goes on. On it may be built progress, not only in forestry but in the utilization of forest growth. If an amateur may presume to point out aspects in which it has not advanced proportionately, he might mention first the problem of more rapid tree growth, and second the gaps in our knowledge of the chemical and physicial properties of wood. Cell formation is a deliberate process in some plants; far more rapid in others. What is to prevent some forest Burbank from breeding a species that will grow four times as fast as trees do now? On the chemical side our utilization studies lack fundamental facts by which to guide their development.

Wood must prosper or fail in market competition with other materials in the measure that it meets use requirements. It is a little handicapped in such competition, but not fatally so. The makers of other and competing materials can and do alter their products practically at will to meet specific situations. A little more carbon, and steel is stronger; a little more nickel and it is tougher; add some chromium and it will resist rust. Set the rolls a little farther apart and it comes in just the width or thickness desired. By selecting his clays or varying his firing heats, the ceramics manufacturer can at will achieve a wide variety of appearance and physical properties. Variation of formulas makes aviation metals stronger, stiffer, more malleable, or more corrosion resistant, as these properties become most important.

With wood it is different. Wood comes to us with its physical properties fixed in the tree. With one or two important exceptions its adaption to special use requirements has so far been limited to a choice of species. It has been partly protected against decay, and its moisture content in part placed under control. Beyond this the lumber producing industry holds out to its users merely a variety of sticks, inviting them to choose that which most nearly meets the purpose. It is not surprising that the prospective purchaser often goes away and uses something else.

Obviously, there are two general lines of attack on this situation. (1) properties of wood can be influenced by physical or chemical measures or more closely controlled by selection, to offer the user a greater variety of choice or a more uniform product for his purposes. (2) The user can be shown how to adjust the material more economically or more effectively to his purposes.

Much of course has been done along both these lines, but much more remains to be done. Take the airplane, for example. Years of work at the Forest Products Laboratory have so developed the possibilities of glue that wood aircraft frames are put together without a nail. Companion efforts have discovered the strongest and lightest forms for wood beams and struts. Careful methods of selection have developed airplane lumber grades of high strength and uniformity. All this is not enough. For every dollar the government (not the industry) has spent to improve the use of wood in airplanes the producers of aviation metals have spent ten. They have vastly improved *both* the material and its utilization, and the market trend is at present away from wood.

Take another example. Light floor construction for generations consisted of thin wood joists with lath and plaster below and a sub- and finish floor of inch lumber above. It had its disadvantages and limitations, and lumbermen seemed satisfied. Steel producers were not. Through fifteen years of trial and error they strove and at last succeeded in putting on the market a light steel joist that might compete effectively with wood for the purpose, that, finished with metal lath and plaster, substitutes a one-hour fire rating for the uncertain resistance of the wood joisted floor, and that affords wider spans and lesser depths and greater stiffness. The steel joist employs discoveries in rolling mill operation; it takes advantage of a previously unknown method of attaching part to part (electric welding) and it provides carefully detailed instructions to users, to bring about success.

As a result, lumbermen are mightily concerned about the steel house. Yet the answers to this aggressive development work have laid at hand for several years. The user could have been supplied with dry and suitable graded lumber and taught to require it. He could have been told that shear stresses, twice those ordinarily applied, are perfectly safe for thin joists. The deflections in long spans could have been overcome with double-length, semi-continuous joists, with glued-up laminated joists cambered for stiffness, with restraint over supports, with floor thicknesses that efficiently distribute load. Fire resistance requirements could have been met with other types of floors, just as economical and more serviceable.

Much work is necessary before we can commercially modify the strength and stiffness of wood, make it plastic to pressure, increase its hardness or density, coat it with a moisture excluding surface, inhibit shrinkage, or bring about the various other changes that will increase its range of use.

Still more progress must be made before the era of complete chemical transformation that undoubtedly will turn forest waste into materials now unimagined. Such efforts should be pressed industriously, but what can be done in the meantime? We can help users to appreciate and make the most of the wood as we now offer it.

Working stresses for wood of structural sizes have so far been more a matter for inter-species discussion and building code give-and-take than a strong consideration in the choice of materials. Usually the decision between wood and other materials is determined by other characteristics. The stresses in use today are complicated by many factors besides the strength of the wood, and they are pre-

dicated on a viewpoint which is fundamentally unlike that underlying working stresses for other materials, i.e. that the material may be insufficiently conditioned for its purpose; that the individual pieces may be used to the worst possible advantage as regards their inherent defects; that skilled design and competent supervision of construction and careful selection of material may be lacking. All these contingencies are probably present under present conditions and all of them are avoidable if timber construction receives intelligent consideration from engineers. Where would reinforced concrete, with its infinitely more complicated technique, be now as a construction material if its proponents had assumed that it would always be used with the average skill and intelligence of a workman? And with timber design limited, as it now is, by working stresses based on such a conception, what incentive is there for users to design carefully, to demand high grade material and to use it skillfully and economically?

It is true that strength is not often a controlling factor, at present, in deciding for or against the use of wood for structural framing. It is just as true that wood's entry into markets not now open depends on a better recognition of its strength and in capitalization of improved technique in more economical design. The development of these possibilities involves numerous major problems of research, both in the laboratory and in field application.

For example, the two characteristics in which wood excels are compressive strength and tensile strength parallel to grain, yet we are just beginning to experiment with wood arches, which take fullest advantage of the former, and we have just now secured worth while information on the holding power of bolts, which enables us to take advantage of the latter. We take too conservative a view of the strength of timber columns and we are too cautious in assessing the strength values of a grade under intelligent usage.

Automobile body manufacturers use screws to attach one piece of wood to another. So do many other fabricators of wooden articles. But does anyone know of a thorough investigation of the holding power of screws in wood, their effective spacing, the best relationship of pitch and shank and depth of thread for different species?

The insulating value of wood is one of its important advantages in competition with other materials. Only recently, however, has this property been investigated and the results secured in systematic form for the different commercial species.

That the information wood users need is only partly available is by no means a reflection on established research agencies. With limited facilities they have accomplished much in a vast field which includes many other phases beside user's information. Most of what has been accomplished they have done for the lumber industry. Much more remains to be done,—and continues to remain so. The job involves not only research, but also painstaking, sincere collaboration between producers, laboratory staff and users in the interpretation of results, and efficient education of users to take advantage of them.

BRIEFER ARTICLES AND NOTES

Forest Industries Federation Proposed

The executive committee of the Directors of the National Lumber Manufacturers Association and chairmen of standing committees met in Washington, D. C., on January 25, to consider plans for trade extension and other association activities during 1932. Reports were also presented on work accomplished during the past year.

Wilson Compton, Secretary and Manager, reviewed the work of the year and outlined imperative objectives of the immediate future.

A novel and perhaps the most interest-provoking proposal on the agenda submitted by Dr. Compton was one for an examination of the advisability of extending the scope of the national association in the direction of a federation of the wood producing industries, as has been advocated by the U. S. Timber Conservation Board. Pointing to the $9.000,-000,000 investment in timber, Dr. Compton said that the present and prospective demand for lumber alone could not be expected to carry it. The forests of the lumber industries need a diversification of products. As an aid and encouragement to progress in this direction he proposed the formation of an American forest products industries federation, of which the lumber industry would be the backbone. The method advocated was one of gradual growth rather than complete pre-planning.

Institute of Forest Genetics

The Eddy Tree Breeding Station, at Placerville, California, will henceforth be known as the "Institute of Forest Genetics," according to an announcement from Lloyd Austin, director of the enterprise since its establishment in 1925. The new name is felt to be more descriptive of its character and purpose.

In connection with the change of name, steps have been taken to insure the long-continued existence of the Institute by providing for an enlarged, self-perpetuating board of trustees and increasing the sources of support. Since comprehensive experiments with forest trees must often be carried on over periods of many years, a permanent endownment for the Institute will be sought in the near future. The founder and chief benefactor of the project in the past is Mr. James G. Eddy, a Washington lumberman who had the imagination to see in Luther Burbank's achievements with domestic plants a key to the solution of the problems of reforestation and timber supply.

Personnel and objectives of the Institute are unaffected by the change of name. For the present, effort will continue to be concentrated on the development of improved, rapid-growing timber trees. Resistance to insects, disease, and drought will receive special consideration in the later stages of development.

Most of the work now being done at the Institute is with pines, of which more than one hundred species and important varieties are growing in the arboretum in Placerville. This is the most complete

collection of pines in the world, exceeding even that of Kew Gardens. The existence of so many species plus the fact that the pines are among the most widely distributed and generally useful of the conifers led the Institute to choose them for primary consideration in the field of the softwoods. In the hardwood field, attention is being focussed on the walnuts, some of which are planted in the Placerville arboretum and some on a tract leased from the California state nursery, at Davis.

The pines in the arboretum were nearly all grown from seed under uniform environmental conditions to determine accurately just which are the fastest growing species. Detailed growth records were kept while the trees were in the nursery and a "vigorous" and a "normal" specimen for each species selected for planting in the arboretum, where measurements continue to be made regularly. This species test is without doubt the most complete and comprehensive ever undertaken in the forestry field.

Even more interesting from the standpoint of indicated results is the progeny test, now in its third year. This test is to determine the fastest growing geographical races and the exceptional individuals of a species. Seed is obtained from known parent trees, planted in identical seed-beds, and the comparative development observed in detail. Seedlings from 750 ponderosa pine trees are now growing in the nursery, and striking differences in vigor emphasize the importance of seed selection in a reforestation program.

Extensive hybridization experiments are also being carried on. In this phase of the work, the Institute of Forest Genetics is fortunate in having readily accessible mature stands of several important species of pines, including the exceptionally fast growing Monterey pine. Important new techniques for artificial pollenization have been developed, and a number of species have been successfully cross-fertilized. An interesting hybrid has been produced by crossing Monterey pine with knobcone pine, and seed obtained by fertilizing ponderosa pine with pollen from several other species will be planted this spring. The Institute has also had the coöperation of university geneticists in seeking to change inherent characteristics by X-raying seed.

Much of the work is just now reaching the point where definite findings can be reported, and during the next two years the Institute expects to publish twenty or more articles in various periodicals. One of these will be published in an early issue of the JOURNAL OF FORESTRY.

PRELIMINARY FOREST SURVEYS COMPLETED IN SOUTH

The federal forest survey office in the South has completed the preliminary surveys for both the bottomland hardwoods and the pine. The preliminary hardwood survey covered 503,000 acres, all of East and West Carroll parishes, Louisiana, and the pine preliminary in Pearl River County, Mississippi, covered 510,000 acres. A "Field Manual for the Forest Survey in the Bottomland Hardwoods of the Mississippi Delta" has been prepared by G. H. Lentz who has been in charge of the field work. A similar field manual is in preparation for the conduct of the work in the pine region of the South.

Work in the bottomland hardwoods was resumed the latter part of January when three field crews of three men each were sent into the field. As a result of the analysis of the preliminary hardwood data it was decided to run the survey lines ten miles apart with quarter-acre sample plots taken every ten chains.

Mississippi will be the first state to be covered by the Survey and, if weather and flood conditions permit, the hardwood bottoms will be worked before the pine uplands.

Log and Stumpage Prices for 1930

Average prices by species and type of sale of privately owned standing timber involving more than seven billion feet in 44 states are reported in Statistical Bulletin No. 37-S, just published by the Forest Service, U. S. Department of Agriculture. The figures, tabulated by states and regions, are based on the records of 4,670 sales. Average prices of more than 7.5 billion feet of logs f.o.b. the manufacturing plant in 39 states also are reported in the bulletin.

According to the bulletin, 78 per cent of the standing timber reported as sold in 1930 was virgin timber; 17 per cent was second growth; and 5 per cent was of mixed origin and second, or "culled" virgin stands. Ninety-three per cent of the logs reported sold in 1930 were intended primarily for manufacture into lumber, the other common uses of logs, such as veneer, ties, box shooks, etc., accounting for only a small proportion of the total.

A comparison of stumpage and log prices for 1930 and 1929 shows a general decrease in 1930 of 13 per cent and 10 per cent respectively. The average wholesale price of twelve representative lumber items shows a decrease of nearly 8 per cent in 1930, and the average price paid by contractors for six representative lumber items in eight representative cities, shows a decrease of nearly 4.5 per cent in 1930 as compared to 1929.

Comparative Merits of Different Portable Hand Power Fire Pumps

The following five most commonly used fire pumps were tested by the Lake States Forest Experiment Station in 1931, conducted in coöperation with the Michigan Department of Conservation:

1. Galvanized iron knapsack tank with single-action trombone pump.
2. Galvanized iron knapsack tank with built-in single action plunger pump.
3. Reinforced copper knapsack tank with built-in diaphragm pump.
4. Upright cylindrical galvanized iron tank with built-in single action plunger pump.
5. Galvanized iron knapsack tank with built-in *double* action plunger pump.

Fire pumps No. 1 and No. 3 are operated while on the back of the operator which makes possible the most effective and economical use of their contents. Pumps Nos. 2, 4 and 5, on the other hand, must be set down when operated, which results in a loss of time and waste of water, since the tendency is to attempt to cover too much ground from one place.

Pump No. 1 is the lighest and has the greatest effective capacity per unit weight, but is somewhat less rugged than the others and the trombone pump with which it is equipped makes it awkward to transport and subject to damage. While the stream delivered is intermittent, it fluctuates but little and is readily directed and effective at normal range.

Pump No. 2 is rugged and handy to transport. It has a relatively high effective capacity in relation to weight, but the stream delivered fluctuates widely, which results in considerable waste.

Pump No. 3, while heavier than Pump No. 1 and smaller in capacity, lasts longer and delivers a steady stream with a minimum of waste. The volume of water delivered, however, owing to the size of nozzle with which it is equipped, is too

small to be generally effective. While rugged in construction the protruding pump handle makes it awkward to transport and subject to damage.

Pump No. 4 has no particular advantage except a slightly longer range. On the other hand, it delivers a fluctuating stream, is heavy and awkward to carry and, hence, not suited to field use.

The chief advantage of pump No. 5 lies in its double action pump which tends to minimize the fluctuation of the stream delivered and thus reduce waste. Its high rate of discharge and small capacity tank, however, make it short lived.

Results of the test are given in Table 1, taken from the experiment stations Technical Note 47.

Man-power Placement and Facilities for Fire Control

In an interesting and instructive paper read before the Northern Rocky Mountain Section of the Society on December 7, 1931, Mr. L. G. Hornby discussed the planning of transportation routes in relation to man-power locations for fire control.

Mr. Hornby pointed out that satisfactory fire control is the least total cost of prevention plus suppression plus satisfactory limit of damage. What value of damage is satisfactory has not been determined. The present assumed objectives of maximum permissible damage for each timber type were shown to determine the

Table 1

Comparison of five types of hand-power fire pumps

	Pump number				
	1	2	3	4	5
Weight (pounds):					
Empty	8.4	12.8	15.4	15.3	14.0
Full	45.9	53.1	46.2	53.5	46.0
Capacity (gallons):					
Rated	5	5	3.5	5	4
Effective	4.4	4.5	3.6	4.1	3.6
Gross weight pounds per gallon	10.5	11.7	12.7	13.0	13.0
Number of strokes:					
Average per gallon	42	36	58	34	36
Discharge (gallons):					
Average per minute	.87	1.2	.63	1.17	1.47
Time to exhaust:					
Average minutes	5.0	3.8	5.8	3.5	2.4
Range (feet):					
Average normal	26	25	28	35	22
Maximum	42	40	40	50	40
Vertical	26	30	36	33	34
Per cent of effective capacity delivered in 2′ circle at:					
10 feet	82.0	57.6	95.4	56.6	66.3
20 feet	24.6	13.7	58.3	19.8	20.2
30 feet	7.7	4.8	12.1	9.0	6.4
40 feet	0.7	.3	.3	3.2	Trace
Character of stream delivered:	Intermittent	Fluctuating	Steady	Fluctuating	Fluctuating

necessary costs of prevention and suppression and hence the organization and facilities necessary to accomplish these standards.

Objectives of detection have been established for each timber and fuel type according to the relative dangers of rapid spread. The men placed to meet these visible area standards are also assigned smokechaser areas, within which they are responsible for first attack on all fires. The distance of travel is governed by travel-time standards applicable to different degrees of fire danger. After considerable expansion of detection from patrol points a detection coverage of about 95 per cent has resulted from the standards. The planning includes determination of all facilities necessary during the worst danger periods. During easier periods some positions will be unoccupied. In order to estimate the average annual protection cost, the expense of providing different degrees of organization over a ten-year period are determined and this total divided by ten.

Mr. Hornby then discussed planning for reinforcement action after fires have escaped from first attackers. Here it was shown that the number of men which should be sent varies considerably in green timber by types as well as by time of year and character of the season. During critical dangers in dead fuels, type is not so much a factor in man-power needs as volume of fuel.

It was also pointed out that about 15 per cent of the fires in the Northern Rocky Mountain region include all the really troublesome ones. Less than 1 per cent of the total fires have been responsible for the damages being greater than allowable during the past ten years, as measured by present standards.

A strong and very fast first attack and early reinforcements arrival were advocated by Mr. Hornby as necessary to prevent the escape of these exceptional fires.

In closing, it was stated that present-planning methods are in the development stage. The analysis of 12,000 fires during the past ten years is progressively yielding reliable data on speed and strength of attack needed under different type, fuel and weather conditions.

G. Jemison, *Reporter.*

Should Publicity be Given to Incendiary Fires?

At its meeting in Missoula, Mont., on January 18, 1932, the Northern Rocky Mountain Section of the society discussed publicity of incendiary fires.

Supervisor Theodore Shoemaker quoted figures bringing out the seriousness of the incendiary fire problem in Region One. During the period 1921-1930, out of a total of 12,056 fires in the 13 western national forests, 3,946 were man-caused, and 506 or 4.2 per cent were incendiary, resulting in suppression costs and damages amounting to $961,000. Statistics show that incendiarism was at its peak at the beginning of the 10-year period, fell off irregularly but rapidly to 1928, and then increased suddenly during the last three years to a figure considerably higher than the 10-year average for this class of fires.

Mr. Shoemaker pointed out that incendiary fires are very much localized and expressed himself to be strongly in favor of publicity, believing that it helps to arouse greater sentiment against incendiarism.

Mr. Warren B. Davis, editor of the *Missoulian,* stated that he did not see how we could stop giving publicity to incendiary fires without the coöperation of the newspapers. Newspapers have always coöperated with the Forest Service, but if refused this information it would be up to the papers to get it from what source

they could, since they have a duty to perform in giving news to their readers. He expressed the belief that publicity does not get to the people whose minds are open to the power of suggestion as that class does not usually read the papers, and the only solution of the problem is a frank statement of facts in regard to any fire. He hopes that the Forest Service will follow the policy of the past which, in his opinion, is best for the newspaper, the public, the Forest Service and the forests.

Professor E. A. Atkinson, of the University of Montana, discussing the problem from the psychological point of view, agreed with Mr. Davis in that if the newspaper wanted to give publicity to fires it could. However, he believes that newspaper publicity does get to all classes of people eventually, either through reading or via the "grapevine route." Publicity does not tend to increase the number of incendiary fires, since the class whose minds are open to the power of suggestion would already have the idea. There could be quite a wide variation in the amount and kind of publicity given, and he believes that if more publicity were given to the apprehension of such incendiarists it would help to frighten them. The important thing to remember, Professor Atkinson emphasized, is that in Missoula, the United States, and the world over, there seems to be only one thing to stop crime and that is certainty of punishment. To accomplish this newspapers should show an increased move for apprehension and, as an example, news of such a meeting as was held here would produce more results than all the news we could put in the papers next summer.

In the discussion that followed Howard Flint stated that he felt certain that every year a number of fires get in the incendiary column that rightly belong elsewhere, but this is not true to as large an extent now as in previous years. Perhaps 90 per cent of the incendiary fires are caused by local settlers, rather than by the gangs which congregate on the streets of the cities. He also stated that out of the 506 fires set, as quoted by Mr. Shoemaker, only about five men have been apprehended and three put in jail. Improvement can be made in this direction, but not rapidly, he believes.

R. F. Hammatt, in charge of Public Relations, asked how we were to get the help of the majority of the people if they did not know there was an incendiary fire problem jeopardizing their property and the property of others; and whether it was the intention to give publicity concerning the fact that there are large fires doing a lot of damage or the fact that they were caused by incendiarism. To this Mr. Davis replied that the question of the reading public is always, "What caused this fire; railroad, campers, lightning, or what?" He stated that he felt there was no need to pay much attention to the smaller incendiary fires, but with a larger fire, where a large number of people are interested they naturally want to know the cause of it.

John B. Taylor, former supervisor, feels that there is a limit as to what we should expect from the newspapers in the way of suppressing news of fires. The newspapers of Montana have always been very cordial in following out our requests and he feels that we would have no right to ask more of them.

Mr. Hammatt compared incendiarism to the crime situation in Chicago which seemed almost hopeless a few years ago. Much publicity on crime has been given to arouse public sentiment to the point that something will be done.

T. C. Spaulding, dean of the Forest School, University of Montana, stated that he believed that the general public was not behind the Forest Service or the protective associations, and consequently, the public would not give information to lead

to the arrest and conviction of incendiarists. This, in his opinion, explains why we are unable to get more than one per cent conviction in these cases.

Fred E. Thieme, Regional Engineer, does not believe that people are fundamentally criminals. The more the publicity, the more people are inclined to inform forest officers of their suspicions.

Lyle Watts, director of the Experiment Station, cited an illustration as to the relationship between publicity and fear of apprehension. In southern Idaho last summer they had a flood of incendiary fires to which a good deal of publicity was given but no good seemed to result. Finally, the press was flooded, and the Governor declared martial law within the area and stationed troops around it, throwing fear of apprehension into the guilty parties, and while this publicity did not result in catching any culprits, incendiary fires stopped in the middle of the fire season.

Mr. Hammatt suggested that we appoint 1,500 or 2,000 reliable citizens in Montana next summer and give wide publicity to the fact that these men were going to be on the lookout for every fire of which they become suspicious. Professor Atkinson's comment to this was that the only way to cope with the situation next summer is to actually deputize all the reliable citizens possible and broadcast it over the country before the fire season gets underway.

Mr. W. W. White, fire fighter and sage, stated that in his opinion, only a very few firebugs were responsible for the 500 some fires set. A fair percentage of the public is already over-sold on incendiary fires. He believes that practically every fire is considered incendiary by the public, and thinks harm may be done by giving out a lot of publicity about fires being incendiary that are not.

D. S. Olson, labor agent, stated that in his opinion the firebug had a decided advantage over us. While publicity might gain thousands on our side, it might incite one or two firebugs to activity and his work would do more damage than would be offset by the help of the thousands. Mr. Watts stated that he felt more help would be obtained from six undercover secret service operators than from the 2,000 citizens suggested by Mr. Hammatt.

Mr. P. J. O'Brien, law enforcement officer, stated that he was much interested in hearing the discussions and theories advanced as to how this thing can be handled, but feels that he knows the practical side of it. He stated that it was a local problem every time. The trouble lies, not in the catching, but the conviction of the guilty parties, and for conviction we must have the support of the local people.

Export Difficulties of the German Forest Industry

Arthur C. Ringland, foreign observer for U. S. Department of Agriculture has sent in the following significant information.

Unfavorable market conditions, sales difficulties arising from extensive Russian wood imports, the slump in the building trades, etc., have made the question of wood exports a very important one for the South German States. But these exports are rendered more and more difficult on account of import restrictions on the part of neighboring countries.

France has decided upon a wood import contingent of 37,383 tons (excluding crossties) for the first quarter of 1932. As during the same period of 1931 total German wood exports to France amounted to 75,911 tons, the above figure represents a reduction of 50 per cent.

On January 30, 1932, Switzerland in-

troduced import restrictions, i. e., import permits. The contingent has not yet been made known, but it is maintained that through the new regulations German imports into Switzerland will be reduced by 50 million marks. Exports of wood and wood products will, it is stated, be mostly affected thereby.

Toward the end of December 1931, import prohibitions were issued by Poland amongst others for pasteboard, paper, newsprint and large quantities of wood products.

Czechoslovakia too has reduced imports of German wood products as of January 20, which is the more surprising, as Czechoslovakian wood imports into Germany are holding second place closely following those from Russia.

German forestry circles as well as the wood trade have therefore, requested the federal government to take countermeasurers against such an unjustified procedure.

The fact that Switzerland and France, normally countries of deficient production, have set up contingents on wood imports is particularly revealing. The German forest industry has made strong representations to the government, particularly protesting Russian imports; however, I am told that the Finance Ministry hesitates to act, because Russia is paying in part for its German imports, machinery, for example, with timber, and that it would be difficult to secure payment in any other way.

Mr. Ringland obtained his information from 1932 issues of the *Deutsche Forstwirt* and from conversations with German foresters.

New Text in Forest Mensuration

Announcement is made that "Elements of Forest Mensuration" by H. H. Chapman and D. B. Demeritt, authors and publishers, will be ready about the middle of June. The book is printed and distributed by J. B. Lyon & Co., Albany, N. Y. The new text takes up the subject from a revolutionary viewpoint—the economic approach. In their preface the authors state that heretofore instruction followed the course of physical operations and appeared logical. But it overlooked the basic economic relations, which determine the value of the products and of the standing timber and for this reason govern the character, intensiveness and cost of all operations in forest mensuration. The student was thus required by the former method to learn how things were done with no real grasp of the reason why they must be done that way.

Mexican Conservation Agencies Propose Establishing National Park

Miguel A. de Quevedo, President of the Society of Mexican Foresters, writes in the January 1932 number of *Mexico Forestal* of the proposed National Park to be named in honor of Baron Alexander von Humboldt. This area lies within the immediate vicinity of the City of Taxco, State of Guerrero. At the present time plans are under way to exploit the area of which sponsors of the park movement are apprehensive. As a consequence, Senor Quevedo was commissioned by the Society of Mexican Foresters and the "Friends of Taxco" to make an investigation of the area. Sr. Quevedo reports that proper rules have been drawn to protect the resource. However, he believes, that despite the precautions that would be taken that any commercial use of the area should be prohibited. This contention, he states, is based on three factors. The first is that the area has a rich historical background and should be reserved from exploitation because of this fact alone. Sec-

ondly, the forest is a remnant of the vast stands that once grew and flourished in the region but which have been dissipated through unrestricted use. Third, the area has a high recreation value of the people of Taxco and if established as a national park will prove to be an attraction which will stimulate tourist travel to this city. Therefore, Quevedo concludes, it would be fitting and proper to set this area aside as a national park and name it in honor of the great explorer and naturalist, Baron Alexander von Humboldt.

The editor states at the close of the article that proper steps have been taken to have this area reserved.

ARNOLD N. WEBER,
El Dorado National Forest.

FOREST RANGERS GO ON THE AIR

The life and experiences of Uncle Sam's Forest Rangers is being relived for the radio audience in a series of new and dramatic plays during the 1932 National and Western Farm and Home Hour programs. These ranger dramas, prepared by C. E. Randall, of the Forest Service, Washington, D. C., are to be presented by experienced actors over a nation-wide hook-up through the coöperation of the National Broadcasting Company. The characters in the plays are Ranger Jim Robbins, his wife Bess, and cub Assistant Ranger Jerry Quick, together with a supervisor, a villain, a girl and other minor characters. The signature music for these radio plays will be the "Rangers' Song" from *Rio Rita.*

Uncle Sam's Forest Rangers are being presented weekly by the N. B. C. over two networks, as follows:

1. From the N. B. C. studio at Chicago over a network of 45 stations, every Thursday beginning January 7, at 12 M., central standard time; 1 P. M. eastern standard time.

2. From the N. B. C. studio at San Francisco over a network of ten stations, every Monday, beginning February 1, at 12.45 P. M., Pacific standard time; 1.45 P. M., mountain standard time.

The N. B. C. San Francisco broadcast will be practically the same as that released from the Chicago studio, except that each drama will follow the original broadcast three weeks later.

A GOOD TIME FOR THE FORESTRY SCHOOLS TO TAKE STOCK

The wide-spread unemployment among foresters should have a salutary effect on the forestry schools. Very few of the past year's graduates obtained employment in forestry work, many graduates of ten or more years of experience in private employ have been thrown out of work, and a new class of perhaps 400 will leave this spring with little or nothing in sight in the way of jobs. If the schools do not grasp the lull in the demand for their graduates to analyse their own work and objectives it will be an indication that they have slipped into a state of smug complacence. For several decades they have "hitch-hiked" in public employment vehicles. They have had a much too easy time. In spite of some local differences in curricula they have turned out pretty much of a standard product fitted for a field that is past its period of rapid expansion. This is a good time for them to reconsider their objectives, or establish some definite ones where there have been none. It is a good time for some of them to ask themselves if they are really needed and for others to determine if they have not acquired some frills and non-essentials; if their teachers have grown with the times; if they had not better diversify their training to fit their graduates for more than just one class of employer. It is also a good time to sit down with the private

forest industries to get acquainted with them and solicit a more sympathetic attitude toward college training as a foundation for developing their officers. It is not wholesome for the schools to have to depend upon new legislation to absorb their growing classes of graduates. The forest industries will have undergone a great change of attitude and outlook when they emerge from their economic crisis. Are the forestry schools ready for it?

EMANUEL FRITZ,
Editor-in-Chief.

COLORADO SCHOOL OF FORESTRY TO CLOSE

After a career of over twenty-five years the School of Forestry of Colorado College, at Colorado Springs, Colorado, is to be closed as a result of the increasing financial burden of conducting it.

The school was one of the earliest forestry schools to be established in the United States. Throughout its existence it has had opportunities and facilities afforded by the ownership, accessibility, and use of a splendid field laboratory and demonstration forest of over 6,000 acres of excellent ponderosa pine timber in the mountains just west of Colorado Springs. This tract, known as Manitou Forest, was given to Colorado College in 1906 by General William J. Palmer (long a trustee and valued friend of Colorado College and a benefactor of it in many ways) and his friend Dr. William A. Bell (an English physician who for many years was a resident of the Pikes Peak region).

The Colorado School of Forestry has always been relatively small, that fact being one of the distinct advantages which it was able to offer in personal attention for its students. At the same time, this smallness of its student body has been a distinct financial burden to the College which the trustees reluctantly decided in June, 1931, they could no longer continue to meet. While some revenue could be expected regularly from the cutting of timber from Manitou Forest, the rate of growth of the ponderosa pine in the Rocky Mountain region is so slow that the financial returns from such operations could never be expected to meet or even come near meeting the deficit.

Another factor in the situation was the complete reorganization of the entire educational program at Colorado College, eliminating a number of distinctly specialized technical courses which had crept into the school and placing the emphasis where it was felt that a small college should put it, that is, upon the liberal arts courses leading to the A. B. degree.

The trustees of the College therefore definitely announced that the forestry program would be continued in full for the three-year period necessary to allow the freshmen who began their forestry course in the fall of 1930 to complete their work for the bachelor's degree. No new students are being accepted for the forestry course and according to the present plans the School will be discontinued entirely after June, 1934.

The trustees have tentatively approved the proposition of permanently retaining Manitou Forest in College ownership and handling it as a demonstration forest. The details as to how this will be worked out have not yet been completed.

GORDON PARKER,
Director, Colorado School of Forestry.

REVIEWS

Edited by Dr. Henry Schmitz, University of Minnesota, St. Paul, Minn.

Research in Agricultural Land Utilization—Scope and Method. Advisory Committee on Social and Economic Research in Agriculture. John D. Black, Editor. *Bull. 2. Social Science Research Council. Pp. 201. 230 Park Avenue, New York. 1931. 75 cents.*

This bulletin has much claim to rank as the most important publication so far issued in the United States in the field of land utilization. The constantly widening scope of forest administration and its necessarily increasing concern in land use determination make this bulletin one of primary importance to the forester.

The bulletin gives, first, illuminative short chapters on the objectives of land utilization research, the field of such research and the qualifications of research workers for this field. The bulk of the volume is then given to the development of the field to be covered, the problems involved, and the methods for their solution, by way of concrete statement in some 38 "projects," presented by some two dozen contributors. These projects are presented under the following headings:

1. Projects involving the description and explanation of the land utilization of an area (20 projects).
   a. Natural factors (10 projects).
   b. Social factors (10 projects).
2. Projects involving the forecasting of the most advantageous use of land (10 projects).
3. Projects involving non-agricultural land uses especially (5 projects; especially devoted to forestry).
4. Miscellaneous (3 projects).
5. Projects directed specifically at developing land utilization theory (in which no numbered projects are outlined but the differences involved in the point of view are discussed, and suggestions are presented, chiefly by Professor G. S. Wehrwein, for the development of such projects).

As a reference publication the bulletin suffers severely from having no more detailed table of contents than the above grouping. The individual projects are the meat of the matter and the materials to which one must turn in reference use of the volume.

Some of the projects of each group are comprehensive in scope while some are projects devoted to the isolation of particular factors. The more comprehensive projects are written mainly by the leaders in the movement and are in general the more instructive ones. Some of the minor projects betray the distorting effects of the authors' previous fields of work. Like the three blind men and the elephant, some of these men see in land utilization each a different kind of animal. The great merit of this bulletin is that, by presenting them all together, with the main lines of the picture drawn by the abler minds, the presentation is self corrective against the individual vagaries which are so confusing in reading isolated studies. One finishes the volume with a much clearer conception of what, after all, this land utilization is about.

From the forestry point of view, nevertheless, the bulletin leaves much to be desired; although it must not be over-

looked that its scope is definitely meant to be restricted mainly to the problems in the agricultural field. In spite of Dr. Black's understanding comments on sundry relations of forestry to agriculture, the bulletin, outside of the specifically forestry projects, evidences a lack, either of understanding or of proportionate presentation, of what must be considered in the analysis of forest land use. For example, in one of the more comprehensive agricultural projects, but one necessarily contemplating the alternatives of agricultural or forest use, the factors conditioning agricultural use are thoroughly analyzed while forest use analysis is limited to the determination of rate of tree growth, "as is" under undetermined conditions of abuse, without consideration of what that growth might be under better management, or of the forestry economics phases of production and marketing which, on the agricultural side, they would not think of omitting. Nor does the bulletin indicate any realization of the possibility that, in the irrigated west, foothill and mountain lands which may yield a clearly super-marginal return in agriculture, or in grazing, may equally clearly have to be dedicated to forestry, because of the damage which would ensue from erosion due to the other uses, to costly reservoirs or priceless water spreading grounds, or indirectly, if not directly, even to distant valley farming lands which are so much more valuable than the foothill or mountain lands as to require, from the public viewpoint, the sacrifice of agricultural use of the latter.

Dr. Black notes the disagreement, even among land utilization specialists, as to the extent to which forecasting of future use should be undertaken, while "Among agricultural economists other than land economists will be found many who object to all mapping of future uses, looking upon such forecasting as an art without adequate scientific basis." His own statements that, "It will be apparent upon a little thought that one cannot account for the existing uses of land without in considerable measure forecasting land use," (p. 64), and "But land utilization analysis must advance to this stage [forecasting] if it is to do what is most expected of it," (p. 120), indicate rather clearly his own inclination. But how make land use planning into the future safe against unforseeable changes? All ask the question, but no land utilization economist seems to consider the device by which the forester, throughout the history of his art, has secured his only measure of safety for his hundred-year rotation working plans—the provision for periodic revision. Land utilization must come to the forester's practice. It would relieve many present handicaps to recognize it now.

Omission of detailed technique on the forestry side of common problem may be charged in no small part to lack of its adequate development by the foresters themselves. Coöperative developments since the publication of the bulletin give hopeful reassurance in both directions. But if the agricultural economists seem to us to have erred, in this publication, through lack of sufficient counsel with foresters, how much more should we as foresters be warned against the contrary mistake, to which there seems to be some inclination among us, of considering ourselves competent to draw the line between forest and agriculture without the advice and coöperation of agricultural economists.

C. L. Hill,
California Forest Experiment Station.

Resources and Public Finances of Michigan in Relation to the Forest Taxation Problem. By P. A. Herbert. *Progress Report No. 13, Forest Taxation Inquiry, U. S. Forest Service, New Haven, Connecticut, April 1, 1931.*

One of the great merits in the taxation studies made by the Forest Taxation Inquiry lies in the descriptions and analyses of the social and economic structure within which the tax operates. The familiar reports on state tax conditions made by special inquiry tax commissions too often rest satisfied with an analysis of the tax system alone as if the improved system recommended would be universally practicable, working equally well in the circumstances of any locality. Entire parts of a state tax system, however, are the outgrowths of local conditions and the elements and workings of a tax cannot be understood when detached from these conditions.

The taxable resources and public finances of Michigan dealt with by the author are those having a bearing upon forestry taxation so that the forest area of the state assumes the central place in the narrative at once. The delimiting of this area is achieved by dividing the state into six groups of counties made on the basis mainly of the chief economic interest of each county involved. As a result, the names urban, farm-urban, farm group and mineral groups and lower peninsula forest counties and upper peninsula forest counties are the designations of the groups. Certain social and financial elements of each of these county groups are given and the four non-forest groups are used for purposes of comparison with the forest groups in matters of resources, taxes and expenditures.

The forest group of counties when added to that of the minerals, the ground surfaces of the two being nearly identical, constitutes 21,199,000 acres or three-fifths of the entire state area. This immense area of contiguous counties making up the whole upper peninsula of Michigan and the northern part of the lower peninsula is at present only slightly used for farm purposes, 9 per cent of the area of the mineral counties being so utilized and 28 per cent of the strictly forest counties. The entire region has undergone a 7 per cent decline in population during the past decade, although the farm population of the mineral counties was only 4 per square mile and that of the forest counties 7 prior to this time.

The forest and mineral groups of the author are in fact the well known cut-over lands of Michigan, the different parts of which have been named to honor or to condemn, "Cloverland," the "pine barrens," "fisherman's paradise," "Jack Pine Plains," "Nature's playground," etc. Michigan is one of the three Lake States which received in their northern portions from the glacial epoch enormous deposits of light, unfertile sand and many lakes and swamps. This misfortune Nature later tried to hide by giving to this region the great pine forests, the lumbering of which was at its zenith in Michigan in the seventies and eighties of the last century. Abandoned farms and wholly or partly abandoned towns and villages and cities mark the history of this area. Unfitted for farming, owing to the sterility of soil and rigors of climate, this timber denuded region is covered now by some farms, some original timber stands, some second growths, but mainly by popple, jack pine, scrub oak, fire cherry, white birch and tamarack and has afforded a land utlization problem of the most acute sort.

The Forest Tax Inquiry is only one of several studies which have been made into the proper use of this great region. The Michigan Land Economics Survey is doubtless the most ambitious of these. As is well known, that endeavor undertakes

to ascertain in detail the resources of this region, both natural and acquired, and is, in fact, a thoroughgoing inventory county by county of this sub-normal land. Some 17 counties have now been covered by this Survey and eventually the resources of this puzzling region will be known in definite and tangible terms. Surveys of several counties each, in Minnesota and Wisconsin similar to those of Michigan have also been made.

Since the abandonment of the delusion that this was a region of farming land comparable with that found in the southern counties of these states, many projects for reforesting the area have been championed. Some reforestation has been done by both the Federal and the state governments, and Nature, where free from the danger of fires, has restocked large areas with good second growth, though in the main with the inferior stands named above. The whole region was admirably described in respect to its farm uses by two bulletins from the U. S. Dept. of Agriculture, entitled, respectively, *Land Settlement and Colonization in the Great Lake States,* and *Economic Aspects of Land Settlement in the Cut-Over Region of the Great Lake States.* Still more intensively in respect to the part of the area which falls to Michigan, another U. S. Bulletin, *The Economic Aspects of Forest Destruction in Northern Michigan,* has studied the chances for forests in the proper handling of this land.

Small as is the present farm use of this region, the future, seemingly, has nothing in store along this line of a brighter sort. A retreat from the earlier use of this land for farm purposes has set in and there has been "no increased use of crop land and plowable pasture since 1920, and the present prevalence of farm surpluses everywhere promises little need for the use of this land agriculturally for long years to come."

The timber outlook for this natural forest land is scarcely more promising than is that for farming. While "the climatic and soil conditions are favorable to tree growth" over the larger part of this area, "there once was probably over fifty times as much (timber) as now," and while in the upper peninsula "the ratio of valuable young growth is to the inferior sort as two acres to three in the lower peninsula, it is less than one to three." Recreational prospects, the author finds more hopeful. In the forest counties of the lower peninsula 512 plats of resort developments have been laid out since 1915, most of these in recent years. "Twenty-four per cent of the plats laid out since 1915 in the forest counties of the upper peninsula were recorded in the one year, 1927."

The general property tax as to assessment methods and in respect to imposing and collecting the tax runs uniformly throughout the whole state; it applies equally in principle, at least, to the "shorn lamb" of the northern jack pine plains and to the financial and industrial centers like Detroit of the southern counties. Some five taxing jurisdictions secure their revenues from levies upon this assessment, and several of these impose one or more special taxes upon the same base. Here as in other states, the school and road taxes make up the chief exactions aside from the general governmental expenses. No single detail perhaps uncovers more graphically the backwardness of the cut-over region of Michigan than the fact that this three-fifths of the commonwealth has only 8 per cent of the assessed valuation. And the author continues "such a condition as exists in the forest and mineral counties of Michigan must inevitably result in either a heavy tax burden or inadequate public service or both."

The comparative burden of the tax on property in the forest and mineral counties of the state, when set beside the

burdens on the other divisions, shows a distinctly higher tax per $1,000 of assessed valuation for these first groups than for any others. The comparison is as follows: Average tax per $1,000 for the whole state in 1925 equalled $27.56; for mineral group, $35.71; upper peninsula forest group, $42.24; lower peninsula forest group, $36.81; farm group, $27.29; farm-urban group, $29.06; and urban group, $26.10. Tax rates of these sorts furthermore are fairly typical of the groups in which they were found in 1925 since a distribution of the tax rates of the different groups throughout a 25-year period shows the rates for the forest counties to have been uniformly the highest.

The financial trends in the cut-over county groups may be of more significance than is the status of their present revenues and expenses. The total levy upon the property tax for all purposes during a 28-year period has not grown as fast for these county groups as for the state as a whole. For this latter an increase of 1,126 per cent has taken place since 1900, while for the lower peninsula forest group only 330 per cent increase has occurred and for the upper peninsula group 337 per cent and for the mineral group 415 per cent. Plainly, the trend toward collectivism is not as strong in these northern groups as in the rest of the state.

The vagaries of our tax equalization system is reflected doubtless in the fact that while the tax for the state government itself has declined in two of the county groups of the cut-over territory, it has actually increased lately in the hard ridden upper peninsula forest counties. This is indeed a misfortune. Taxpayers may not feel keenly the burden of heavy and increasing taxes if the proceeds of the tax are used for local purposes. Tax payments here may become merely a transfer from individual expenditure to community expenditure with no burden created by the operation. Revenues taken for distant and non-local purposes are not so favorably regarded by the tax payer.

A better picture of the burden of government to the tax payers of the cut-over regions may be gathered perhaps by noticing the specific case of schools. As everyone knows, schools have been a major line of expenditure to local governments everywhere during the past decade. "Michigan's educational ranking," states the author, "as determined for 1924 by both the Ayers and the Phillips Indexes was among the first 6 or 7 state in the country." Similar sources for revenues for education are used uniformly throughout the state, by all political divisions. The support, however, of the standard one-room school may be contributed to by districts having an assessed valuation as high as $3,237,000 in the urban group and by districts having an assessed valuation as low as $10,450 in the forest groups. Certain uniformities of expense are required from all schools by the state authorities, and standard one-room schools which may impose a little felt expense on the tax payers of the first class of districts become a devastating drain upon the taxpayers of the second. Even the state aid which is distributed on the basis of school population goes more largely to the southern cities and towns than to the northern counties because here are the more populous districts.

Tax delinquency is a financial result often put forth as the correct measure of the severity of taxes upon payers, and this is peculiarly true of Michigan where one quarter of the assessed land of the state fails in its tax payments. However, in the forest counties of the state other explanations of delinquency may be made which go far to disqualify this tax effect from being a good index. In 1928 in these counties, for example, two-fifths of the land area, one-quarter of the assessed

valuation and one-fifth of the tax levy were delinquent. The wide disparity between the non-tax paying area and the non-tax paying assessment shows plainly that inferior lands must have been the faulty ones. The lands yielding no taxes must have been the lands which failed to yield everything else, and this and not the severity of the tax was the trouble. Again the portent of delinquency is much worse often than the reality. In Michigan four times the number of delinquencies are reported as are the number of resulting tax sales. Tax delinquency often may be the result of neglect or of strategy on the part of the owner and not of real lack in the lands.

Lastly, the forest counties are dependent almostly wholly upon the property tax for their first hand revenues—approximately 90 per cent being derived from this source by county governments while the township and school districts in all groups are wholly so dependent. The state and the wealthier county groups have special taxes, fees and earnings which relieve them from such complete dependence upon one source. The incomes of the forest and mineral groups are in fact helped out by large aids from the state government as a means of giving them even a minimum of governmental services.

The financial behavior of the cut-over lands may be summarized as follows:

1. Unlike the other parts of the state they have no other resources for revenues than the property tax.
2. Have a higher rate of taxation than other parts.
3. Are unable to make the large levies upon property made in the rest of the state.
4. Need and receive state aid but receive it on an unjust principle.
5. Suffer from the tax equalization system of the state which throws larger burdens of state tax upon some counties than is just.
6. School support imposes a heavier burden here than is true elsewhere in the state.
7. Tax delinquency while nominally large has mitigating features.

W. O. Hedrick,
Professor of Economics,
Michigan State College.

Lives of Game Animals. By Ernest Thompson Seton. *Eight Vols. Pp. 3,115, Maps 50. Illus. 1,500. Doubleday, Doran and Co., Garden City, N. Y. 1931. $40.00.*

This comprehensive work is an account of the land animals in America, north of the Mexican border, which are considered "game," either because they have had the attention of sportsmen, or received the protection of law. Volume I deals with cats, wolves and foxes; II with bears, raccoons, badgers and weasels; III with deer, antelopes, buffalo, sheep and peccary; and IV with squirrels, rabbits, armadillo and opossum.

The writer set about collecting data for this work some thirty years ago. The range maps for the horned game were made in 1898, and since then, have been carried by the author into every state of the Union and into nearly every province of Canada, to get the best local information in the endeavor to make them correct.

The writer mentions the thirty leather-bound manuscript volumes recording his extensive travels and observations. The many quotations throughout the books show how completely the ultimate goal was kept in sight.

Mr. Seton states: "In 1904, owing to attack on the reliability of my animal stories as natural history, I was induced to offer a sample of my serious scientific

work. President Theodore Roosevelt had always been my friend and backer, and about this time he urged me to publish my observations. He said: 'People do not dream how many facts you have to back your stories.' Although far from ready, it seemed wise to respond, so in 1909, I published a preliminary of the present work, as *Life Histories of Northern Animals.*"

This not only had the effect foretold, but the editions were extensively used as reference books about the life habits of the animals set forth in the subject matter. Meanwhile Mr. Seton continued to gather material and experience, never doubting that in three or four years more he would get out two additional volumes to cover the rest of the field. The three or four years grew into ten. When, in 1919, he definitely abandoned all other pursuits to complete the present undertaking, allowing it three full years, it was soon realized that the work done from 1900 to 1907 was wholly out of date—far behind the swiftly moving times. It had to be rewritten, so the work took nearly three times as long as expected.

This is mentioned to emphasize the conscientious care and painstaking effort put forth in the compilation of these data, their accuracy and completeness, becoming a byword among those of experience who assisted the author, and who looked forward with eager interest to the time when the final work would be available for the many uses to which these books would be valuable.

The life zones used are those formulated by Dr. A. J. Allen and Dr. C. Hart Merriam, while some new names and subdivisions have been offered for the region north of the north boundary of the United States.

In the general plan of treating the species the writer followed the system considering each animal under some five hundred different aspects or lights; that is, he considered each under some five hundred question headings, using a system prepared in 1898. This system is given in condensed form under thirty heads in the introduction. Emphasis is placed on the point that where nothing is said nothing is known. The number of blanks serve to bring out how much there is to be done.

The nomenclature comprises the accepted or acceptable English names, the scientific names used by the leading American mammalogists, with important references. The French-Canadian names are given next. Being convinced that Indian names may be of use to historians and travelers, these have been included.

In description the aim is to give only so much for each animal as is necessary for identification, and even then it was found usually necessary to describe each animal three times. Setting forth:

1. The impression it makes as one sees it alive at a short distance.
2. A sufficiently full description, assuming the specimens to be in hand.
3. The peculiar points that would distinguish it from its nearest allies.

In the horned ruminants—known as big game—some space has been alloted to the subject of horns and antlers, aiming to show the record heads.

The subject captions used include the following: speed, tracks, scatology, etc., mind, environment, range, home range, migrations, numbers, food, property, storage habits, relation to light, sociability, means of communication, senses, amusements, mating, home, sanitation, training of the young, love of the beautiful, morality, vice, crime, suicide, enemies and disease, odd partnerships, commensalism, age, strange instances and relation to man.

The sympathetic thoroughness with which the field has been covered in a broad way by using every available source of information, in addition to the extensive field work done by the author,

is shown by the long lists in each volume of acknowledgment of assistant from noted mammalogists, biologists, zoologists, and museum officials of North America.

Mr. Seton's able skill as an artist has made possible the emphasis of the clear descriptive matter with excellent drawings and sketches in addition to the many photographs reproduced. His synoptic drawings and sketches are not equaled in any publication that has come to my notice. These alone should prove stimulating to forest students and officers having to do with lands where these creatures exist. Recently we have been told about the importance of detective activities in effectively administering lands where wild life is a valuable product. To be able to correctly read or define the tracks and signs may be the only method by which what has taken place can be determined. The sketches in these books will prove instructive to those desiring to inform themselves of some of the possibilities in this field.

Special attention is called to the "Lament" in the third volume. Mr. Seton here gives voice to the depression and revolt that has been experienced by millions over seeing the rapid disappearance of wild creatures and plants from their natural habitat during the past thirty years. This should serve as a challenge to foresters to assist in maintaining wild life upon areas where its presence can be beneficial. The opportunities are wide and the field is large.

SMITH RILEY,
Denver, Colo.

Tropical Forests of the Caribbean. By Tom Gill. *Tropical Plant Research Foundation in coöperation with the Charles Lathrop Pack Forestry Trust, Washington, D. C., 1931. Pp. 344; illus. 80 full page halftones; 5 maps. $5.00.*

The author is a technical forester of long experience in the United States and in the American tropics, who has written a number of books on forestry. In this book he has set down in a comprehensive and interesting way the results of three years of travel and investigation in the countries of tropical America north of Brazil, while forester for the Tropical Plant Research Foundation and the Charles Lathrop Pack Forestry Trust.

The book presents a broad picture of the forest resources and the forestry situation in the tropical region bordering the Carribbean Sea, a region which inevitably will influence, at least to some extent, the future forestry program of the United States. With our own timber resources diminishing, particularly our supply of virgin hardwoods capable of producing high grade products, a knowledge of these near-by tropical timber resources is of more immediate and logical concern to the United States than to any other country. American foresters will do well to anticipate the time when the timber needs of the United States cannot be entirely supplied from its own forests, in fact to a time when this country changes from a timber exporting to a timber importing nation.

Because this book represents a pioneering effort in treating of the economic importance, extent and availability of the forest resources on approximately one million square miles of territory bordering the Caribbean, part of a forest region about which very little is known, strict accuracy in all details cannot be expected. It does not attempt to go into the detail that will later be necessary if the United States is to obtain an adequate picture of the potentialities of this great timber region lying to the South, which will undoubtedly be exploited in large measure by American capital. The author points out that much needs to be done, intensive surveys made and research in the silvi-

culture and utilization of these forests undertaken, before their potentialities will be fully understood. Although the author has included maps showing the distribution of the four general forest types (coniferous, 2 per cent; dry forest, 18 per cent; deciduous, 35 per cent; and rain forest, 45 per cent), the type boundaries as shown should not be taken as strictly accurate. For instance, the coniferous forest area as shown in Costa Rica is questioned.

One reason for the widespread underestimation of the value of tropical hardwoods, other than the highly-prized mahogany, Spanish cedar and rosewood, is the lack of exact information on their occurrence, distribution and properties.

In addition to treating in general of the present forest resources in each of the more important countries, the author discusses tropical forest types; the extent to which the forests have been exploited; the laws affecting the use of the forests; the attitude of the public regarding forest conservation; the future outlook for forest development; the influence of forestry measures introduced by the British in their colonies (British Guiana, British Honduras and Trinidad), and by America in Porto Rico and Haiti; present logging methods; wood uses; forest by-products; and the hazards attending commercial forestry undertakings in tropical countries.

In the appendix appears a list of the better known broad-leaved species of the Caribbean region by family and genus, a list of commercial and botanical names of trees mentioned in the text. a bibliography, a tabulation of forested areas of the Caribbean region by countries, and a list of tropical American woods consumed by the wood-using industries in the United States in 1928. The text is splendidly illustrated with 80 full-page reproductions of photographs showing tropical forest conditions.

This book is recommended not only to technical foresters but to the layman who is interested in getting a comprehensive picture of the American tropics. The edition is limited to 1,000 numbered copies.

E. L. Demmon,
Director, Southern Forest Experiment Station.

The Training of Candidates and Probationers for Appointment as Forest Officers in the Government Service. Report of a committee appointed by the Secretary of State for the Colonies. *Colonial Bulletin 61. Published by His Majesty's Stationery Office, London, England. Pp. 55. 1931.*

In May 1930 a committee of seven men prominent in forestry affairs of Great Britain, was appointed by the Secretary of the State of the Colonies "to consider and report on the training of candidates and probationers for appointment as forest officers in the government service." Sir James Irvine, C.B.E., F.R.S., Principal of the University of St. Andrews was appointed Chairman of the committee.

Preliminary studies indicated serious deficiencies in the training of forest officers for the government service and the committee undertook the task of determining whether the unsatisfactory state of affairs was due to:

"(a) the lack of the appropriate intellectual qualities in men attracted to the study of forestry, in which case a solution might be found in schemes designed to recruit candidates of a superior intellectual type;

"(b) the existence of unsuitable or ill-arranged curricula in the several University Schools of Forestry, in which case the remedy would lie in the hands of the University authorities concerned; or

"(c) the possibility that the qualifications required from candidates for the Government Forest Services might be higher

than the Universities could reasonably be expected to provide in a three-year's course."

With the above objectives in view the committee made its investigations and reported their findings in 1931. The report submitted is divided into nine chapters, the titles of which follow: (1) History of Forestry Education in Great Britain; (2) Recruitment for the Forest Services: Supply and Demand; (3) The Forest Officer: His Work, Qualifications, and Training; (4) Teaching in the Schools of Forestry; (5) The Imperial Forestry Institute; (6) Alternative Methods of Recruitment; (7) Proposals for Improvements in Training; (8) The Future of the Imperial Forestry Institute; (9) Summary of Conclusions and Recommendations.

Space is not available to discuss each of the nine chapters, nor would such a review be appropriate, inasmuch as some of them are essentially descriptive and full of detailed information of local application and interest. The reviewer will, therefore, attempt to present the only salient features. The development of forest education is traced in Chapter 1 from 1865 to the present. Three periods are recognized. The first is from 1865, when forest officers were first recruited for the Indian Service, to 1905, when the Forest Service Branch of the Royal Indian Engineering College at Coopers Hill was discontinued. The second period is from 1905, when the forest school was removed to Oxford, until the outbreak of the Great War. During the war, recruitment and educational work were suspended, and the third period covers the years 1919 to 1931. The roles in british forestry played by Sir Dietrich Brandis, Sir William Schlich, Sir William Somerville and others are mentioned briefly. The dates of establishment of the various schools, their institutional organization, the methods of financing each, and the training of landowners, agents and foresters (forest workers) are also included in the historical statement.

There are at the present time five university centers at which training for the forest officer class leading to a degree in forestry is offered. These are the University of Oxford (1905), the University of Cambridge (1907), the University of Aberdeen (1914), the University of Edinburgh (1908), and the University of North Wales, Bangor (1908). Courses for land owners and land agents wishing to study forestry in connection with agriculture and estate management are provided at the Universities of Cambridge, Edinburgh, Aberdeen and Wales, and from time to time at the five other agricultural schools in England and Scotland. Schools for forest workers are established at Parkend and Benmore. These two schools each provide courses covering a two-year period.

Since 1919 the Forestry Commission has annually made grants of 500 pounds each to Oxford, Cambridge and Bangor, and since 1922, an annual grant of 600 pounds to Aberdeen. Since 1924 the Imperial Forestry Institute, associated with the University of Oxford, has received for teaching purposes approximately 7,000 pounds annually, 5,000 pounds being contributed by the Colonial Government and 2,000 pounds by the Forestry Commission.

Detailed descriptions of each of the five university centers for professional training are found in Chapter 4. In each are included essential facts descriptive of organization, staff, finances, curricula and methods of handling field work.

A distinct problem exists in adjusting the occupational opportunities with the form and type of training which should be provided in preparing men for the forest officer class. It is held that "forestry is a specialized profession and requires a specialized and expensive training. . . . On the other hand, scientific forestry is so

little practiced except under government control that the opportunities for remunerative employment at the end of the training period are, practically speaking, restricted to posts in government departments." It is estimated that the number of vacancies likely to be available each year can not be more than from twenty to twenty-five, with the majority of men being trained for the Colonial Forest Service. Yet five schools exist with which to supply this demand.

In further connection with this problem the definite statement is made that the training at the schools is not entirely satisfactory. To quote from the report:

"It may be stated at once that the standard of training at the various schools is neither uniform nor satisfactory. In making this statement we should be doing less than justice if we failed to record our opinion that individually the universities have been at considerable pains to make their schools efficient. That they have fallen short of success appears to be due to reasons which we now proceed to state."

The principal reasons given for this condition of affairs are, first, the lack of adequate financing of the individual schools; second, the difficulty of securing thoroughly qualified instructors, who have had experience in the actual conduct of forest operation; and third, the inability to provide an adequate training in the three-year period required at the universities for the degree; and fourth, the unsatisfactory character of the field training.

A situation exists where there are more schools than are required, and where none of them are providing the most effective types of instruction. To bring all five schools to the desired level of effective instruction would entail a large outlay for salaries and equipment, an outlay which can not be provided.

The committee states frankly that the greatest efficiency combined with economy would undoubtedly be obtained by concentrating all forestry training at a single institution, but factors other than economy and efficiency must be regarded. Local sentiment, the cost to the individual student, and the fact that each of the five universities have committed themselves to considerable expense to meet what they believe to be a public need, must be recognized in the rearrangement for a more effective system of education. It is felt, therefore, that while strong arguments exist in its favor, the concentration of all training at one institution would not be practicable under existing conditions.

In the proposals for improvement in training the committee feel that the instruction in forestry "must be divided between the universities and a central institution which would be equipped and staffed in such a manner as to relieve the universities of the more specialized training and of those branches of instruction which it is most difficult for them to provide." This central institution would be the Imperial Forestry Institute, located at Oxford, and operating in close connection with the School of Forestry.

It is therefore recommended that the course for training forest officers be increased from three to four years; that the first three years of training be taken at a university and that the fourth year be spent at the Imperial Forestry Institute. A degree would be conferred at the conclusion of the third year and a diploma at the end of the Institute course.

As to the division of responsibility between the universities and the Institute, two guiding principles should be followed. First "the Institute would relieve the universities of specialized instruction and also of those subjects the teaching of which could be brought up to the requisite standard only at considerable expense. In the second place, the University must be brought up to a certain minimum level of efficiency and uniformity, so that the post-graduate course at the Institute may follow as smoothly as possible."

In further discussion the point is raised

whether the proposed three-year course should continue to be given by the five universities or should this number be reduced? The report states frankly that "five university schools are not required in Great Britain, and at present we cannot recommend any increase in the total contribution made from public funds towards forestry education at the universities. . . . It is for each university concerned to decide whether it will continue to give a degree course in forestry, having regard to the probable total number of students and to the cost which would be incurred in meeting the requirements we have laid down. We consider, however, that any university which decides to continue the training of forest officers should maintain its instruction at a satisfactory level of efficiency as assessed by the method suggested below.

"We recommend that the Forestry Commissioners, with expert assistance from the other forest services, should make themselves responsible for ensuring, by inspection and in consultation with the other departments recruiting forest probationers, that the instruction is in fact satisfactory. If any school fails to maintain itself at the proper level, its graduates should be regarded as ineligible for probationerships to any Government Forest Service; scholars selected under the scheme proposed in Chapter 6 should not be sent to it for instruction; and any government grant for forestry education, which it ordinarily receives, should be withdrawn."

Considerable space is given to the findings of the committee concerning the recruiting of men for forestry. The selection of men for a forestry training at the completion of their secondary school education, while now being practiced in Burma, is relatively new and untried, and would be attended by obviously serious disadvantage. On the other hand the selection of men upon their graduation from the university has been tried for a number of years, and has failed to produce enough men of required ability. The reasons for this are not discussed, but the implication is very clear that the forest schools are not attracting the men of highest capabilities as are the schools of agriculture and of medicine, and the inference is also plain that college administrators do not regard forestry as one of the educational units in the higher educational brackets, a situation exactly analogus to that existing at many colleges and universities in the United States.

To supplant the present method of recruiting, it is suggested that men who have made excellent records in subjects less specialized than forestry be encouraged through the aid of scholarship grants to continue their studies at the universities and the Institute, and prepare themselves for the Forest Service. Such a method would enlarge the field of recruiting, since recruits could be drawn from any University. A selected scholar would embark on his specialized field with reasonable certainty of eventual appointment. The door would thereby be opened to men of "Honours" calibre and to men with a wide and varied educational background. These men would secure scholarship grants for one, two, or in some cases three years. The system of providing a one-year scholarship to probationers selected for colonial service to carry on for a fourth year at the Imperial Forestry Institute would be continued.

In selecting men for the forest schools, and for the Forest Service, the point is made that oral examinations, and past record and achievement be used instead of written examinations. Personal qualifications as well as those of an intellectual character are important in making these selections. The education of a forest officer is treated at some length. Without presenting in detail the subjects listed, it is well worth while to note the general treatment of this topic. Special mention is made of the necessity for better preparation and training in English, and of the importance of French and German to the forest school student. The

subjects in the physical and biological sciences are much like those listed in the American forest school curriculum. Need of a strong foundation in science is emphasized. The opinion relative to sciences is summed up in the following.

"Taking a broad view of the situation, we are of the opinion that, while the schools of forestry provide on the whole a satisfactory training in the fundamental sciences, they do not provide satisfactory courses in the application of these sciences to forestry. Instruction in such subjects as forest entomology, forest mycology, and forest soils must be given by teachers with practical experience of forest work and must be more specifically adapted to forestry than is at present the case."

Technical subjects are covered but need not be discussed here. The same is true of field work.

Another important phase of the report concerns itself with a detailed statement of the organization, status and future of the Imperial Forestry Institute. The Institute, established at Oxford in 1924, as a result of resolutions passed by the Empire forestry conferences of 1920 and 1923, has more than justified its existence. Although existing on a total annual income of approximately 12,000 to 13,000 pounds for teaching, research and other activities it is inadequately financed, poorly housed, and on a non-permanent footing. Although located at Oxford, the Institute is entirely separate in its organization from the School of Forestry, and on its teaching side is designed to provide post-graduate training as distinct from the education leading to the degree in forestry by Oxford. While its functions include research and the collection and distribution of information of value to forest officers, the provision of higher education for forest officers is of special concern to this committee on forest education.

Statistics and detailed descriptions are available for those who will read the report. While the results obtained have fully justified its organization, the committee feels that it has not done all that it was intended to do or must do. Inadequate income, poor physical accommodations and sense of insecurity are partly responsible. In addition, the Institute has been called upon to provide a training to make up for deficiencies incurred, in many cases, by probationers during their university courses. Nevertheless, it has been doing a valuable service. If it had not remedied the deficiences of the undergraduate education, "it is clear that over the last six years less than a third of the vacancies in the Colonial Forest Service could have been filled by men who, in the opinion of the Examining Boards, were fit for duty."

For the future it is recommended that the handicap under which the Institute suffers be removed as soon as possible. It is preferable that the Institute remain at Oxford, but certain modifications are suggested as to its organization and in its relations with the University. Great care should be taken that the Institute, which will be entrusted with almost a monopoly of higher training in forestry, must not be identified with the School of Forestry of any University. Ultimately, it is suggested that the responsibilities and importance of the Institute will be such as to demand the undivided attention of its own Director.

The report, prepared in a logical form, provides one with an unusually clear picture of the status and problems of forest education in Great Britain, and points many ways for its systematic improvement.

One familiar with the problems of the American forest school recognizes many issues that are quite similar to those in his own country. The problem of occu-

pational opportunities or rather lack of them, the quality of men recruited in the forest schools, the need of a thorough general education, and solid grounding in science, the unsatisfactory character of field work, the excess number of schools, inadequate financing and many other items, are problems that concern the American school to no lesser extent than those of Great Britain.

While the detailed objectives differ in the two countries, the principal aims in each are to prepare men to manage timber lands. Satisfactory results are to be attained only when strong faculties, capable students, adequate financing, and programs of thorough general education and sound technical training are all effectively brought together.

There is little doubt that the suggestions, if followed, will make for a stronger and more effective system of forest education for Great Britain and her Colonies. The Committee has prepared a report which in its broader principles will be of value to forest school educators in every country.

C. H. Guise,
Cornell University.

Land Utilization and the Farm Problem. By L. C. Gray and O. E. Baker. *U. S. Dept. of Agri., Misc. Pub. 97, 1930.*

This publication by two recognized authorities in the field of land utilization brings out the changes in basic conditions affecting agriculture and influencing land utilization in the United States. The first part of the report shows, for instance, that an important shift has occurred in the extension of grain and cotton areas into the more nearly level lands of the semi-acid regions and that severe competition in domestic and foreign markets from these areas and similar ones in Canada, Australia, and Argentina have increased the total output. In addition, there have been important changes in consumption by the elimination of horses, decreases in per capita and of bread grains and beef.

These changing conditions have resulted in the mal-adjustment of agriculture in many regions, and in general over-production of food stuff. Hence, the number of sub-marginal agricultural areas are increasing despite efforts to readjust production. The depletion of the timber resource which formerly supplemented the returns from farming in these marginal communities has tended to accentuate the situation, a situation described by much tax delinquency, farm abandonment, mortgage foreclosure, and financial stringency of local communities. The report ends with a plea for a more conscious and deliberate land utilization policy and with the suggestion that a possible solution would be more forestry.

In addition to its subject matter the report is of interest because of its method of presentation. Instead of long descriptive word pictures, about half of each page is devoted to a graphic presentation of the facts. The reader by a brief studying of pictured evidence can draw his own conclusions without reading a sentence. On this basis the report should meet with favor among those who believe that long wordy reports are not as effective as those that are brief and copiously illustrated.

P. A. Herbert,
Michigan State College.

SOCIETY AFFAIRS

Notice to Contributors

Attention is again called to the fact that the Journal is not published in June, July, August and September. Members of the Society having manuscripts to contribute—articles, notes, and reviews—are asked not to delay them, but to submit them to the Editor as early as possible to give him an opportunity for consideration and editing during the summer months. Manuscripts that are not typewritten (double-spaced), and not accompanied by suggestions for a "leader," or which otherwise are not in good order, may be declined without notice. Contributors are asked to prepare their material according to the style followed in the Journal as to titles, author's identification, subheads, footnotes, and terminal references where these are necessary. In preparing reviews please see that all essential data, including price, is included in the heading, and that it is presented in the order and style followed in the Journal. Please read the report of the Editor, page 351 of the March 1932 issue, and the suggestions to contributors on page 634 of the April 1931 issue.

Doings of the Executive Secretary

March was a busy month in federal forestry legislative activities. The Executive Secretary did his part, insofar as time would permit, in presenting to the several Senate and House Committees, the Society's point of view on appropriations for the United States Forest Service (particularly the Clarke-McNary Law) fire coöperation appropriations, the appropriation to enable the Bureau of Agricultural Economics to maintain a forestry observer in Europe (present incumbent of the position Arthur Ringland); the various proposals to reduce the federal salary scale; and Congressman Scott Leavitt's bill to enlarge the scope of erosion research by the Forest Service.

In addition, note the following letters:

PROPOSED REORGANIZATION OF THE FEDERAL DEPARTMENTS

March 28, 1932.

Hon. John J. Cochran, *Chairman*,
Committee on Expenditures in the Executive Departments,
House of Representatives.

My dear Mr. Cochran:

With reference to the hearings held by your Committee on H. R. 6670 which proposes to place part of the activities of the Forest Service in the proposed Administration of Public Works, the Society of American Foresters would like to submit for your consideration its belief that the functions of the Forest Service logically place it in the Department of Agriculture, and that the same line of reasoning applies to certain other organic conservation activities of the federal Government.

The Nature of Conservation.—Conservation as an organized social and political movement had its origin in the forestry movement, but has spread to many other natural resources.

There are two great groups of natural resources to be conserved: inorganic, nonrenewable resources, such as coal, oil, gas, metals and waters; and organic, or renewable resources—animal and plant life including forests, which, with their

underlying soil constitute the source of all food, fibre, and wood.

In the case of inorganic, non-renewable resources, the only possible conservation consists in thriftily using diminishing supplies, extracting them without waste and utilizing them efficiently. To these ends, the physical and chemical sciences and engineering contribute most.

In the case of organic resources, what is to be conserved is not primarily inert substances, but the vital power of reproduction and growth. Organic conservation must learn and apply not only efficient utilization, but also biological science to control the reproduction, growth, and improvement of plants and animals, and to safeguard the soil and waterflow conditions, on which animals and plants depend.

The Conservation of Organic Resources. The federal organic conservation activities are and have been for many years largely centered in the Department of Agriculture. Its primary function since its creation has been to develop our agricultural resources, through such activities as soil classification, the development of soil fertility, and the prevention of erosion; animal and plant breeding; combatting plant and animal diseases and insects; improving the arts of agriculture, range management, and animal husbandry; and carrying on a wide range of economic, marketing, and regulatory undertakings.

Coördinate with agriculture a major function of the Department is forest conservation. Over a period of fifty years it has developed a broad range of forestry work, which now affects the bulk of all forest lands, public and private, in the United States. Under various acts of Congress, these activities include the administration, protection, and development of the national forests (160 million acres); financial coöperation with practically all forested states in the protection of state and private forest lands, and in reforestation and forest extension; extensive research in all phases of forestry and forest utilization; and (as executive agent of the National Forest Reservation Commission) the purchase of the forest lands for national forests.

The grouping of forestry with agriculture is entirely logical. Basically, and in actual practice, forestry is closely analogous to agriculture in that it is fundamentally the task of raising forest crops from the soil. For one thing, one-third of our forest land is owned by farmers and, in many regions agriculture cannot prosper unless extensive interspersed areas of land are used for forest production to create industries, taxable wealth, and markets for surplus farm labor and farm produce. The forest problem is merely a part of the national land problem and must be fully coördinated with the agriculture and grazing land problems.

A third major function of the Department of Agriculture has long been the conservation of wild life. The Department has charge of the chief part of all federal wild life activities, an extensive program of biological research, the administration of the migratory bird law, the migratory bird refuge law, and many federal refuges, and the control of animals inimical to domestic livestock and game.

The administration of public lands as a part of federal conservation is for the major purpose of maintaining their productivity through technical management. Consequently, public land administration as such is merely a means to the end of conservation. *The separation of public land administration from the underlying technology of soil productivity would be an artificial basis of organization. It cannot be too strongly emphasized that all these functions—research, education, and administration, in the closely interrelated fields of agriculture, forestry, and wild life—constitute an integral and indivisible unit directed to organic conservation; and that to split off any of these functions would weaken the unity and purpose of the nation's program of organic conservation.*

Proposed Plan of Reorganization.— Recognizing the importance of a further concentration of federal conservation ac-

tivities so far as they can logically be grouped together, the Society of American Foresters recommends that the following additional organic conservation activities be transferred to the Department of Agriculture:

1. The unreserved timberlands of the public domain, to be added to the national forests.

2. The public domain grazing lands, to be brought under a system of regulated use comparable to the grazing administration of the national forests. The public domain problem is primarily a problem of soil and plant conservation, erosion control, and animal husbandry, and its administration is contributory to these major purposes.

3. Other agencies dealing primarily with the management of organic resources, including wild life, now in any other department.

This grouping will, we are confident, most effectively insure the efficient conduct of the federal government's organic conservation activities.

I would appreciate an opportunity to appear before your committee for the purpose of more detailed explanation.

Sincerely yours,

FRANKLIN REED,
Executive Secretary.

March 30, 1932.

My dear Mr. Reed:

Receipt is acknowledged of your letter commenting on the provisions of H. R. 6670. This legislation has been re-drafted by a sub-committee and the inclusion of the forests is no longer being considered. We do not plan to have any more hearings on the measure, but your statement will be called to the attention of members when they meet in executive session.

With kind regards, I am

Sincerely yours,

JOHN J. COCHRAN.

PROPOSED PUBLIC DOMAIN LEGISLATION

The Senate Committee on Public Lands and Surveys, and the House Committee on Public Lands, simultaneously have been holding extended hearings on the Report of the President's Committee on the Conservation and Administration of the Public Domain and on the bills which have been introduced to carry out the Committee's recommendations, in whole or in part or with modification. The Executive Secretary appeared in person before both committees to explain the Society's position,—that it holds substantially with the minority point of view of Col. Wm. B. Greeley, the one member of the President's Committee who refused to sign the majority report and to submit the statement of principles given below which was adopted by the Council in January, following discussion of the subject at New Orleans.

1. Such portions of the public domain as are chiefly valuable for forest purposes should be added to the national forests under the procedure provided by Section 8 of the Clarke-McNary law of June 7, 1924.[1]

2. Such portions of the public domain as are determined by the Secretary of the federal department concerned to be valuable and necessary for national defense, reclamation purposes, reservoir sites, national parks and monuments, airport and beacon stations, migratory bird refuges or other public uses should be set aside by Congress for such purposes.

[1]Section 8. That the Secretary of Agriculture is hereby authorized to ascertain and determine the location of public lands chiefly valuable for stream-flow protection or for timber production, which can be economically administered as parts of national forests, and to report his findings to the National Forest Reservation Commission established under the Act of March 1, 1911 (Thirty-sixth Statutes at Large, page 961), and if the Commission shall determine that the administration of said lands by the federal government will protect the flow of streams used for navigation or for irrigation, or will promote a future timber supply, the President shall lay the findings of the commission before the Congress of the United States.

3. The problem of streamflow control and the conservation of soils and water is widely interstate and cannot effectively or equitably be solved by uncoördinated state or individual action. The unreserved public lands bear a vital relationship to the problem. The remaining portions of the public domain, after making the reservations provided in paragraphs 1 and 2 hereof, should therefore be retained in federal ownership and constructively administered by some federal agency, either as national ranges managed along the same general lines as the range resources in the national forests, or as isolated units subject to regulated use and occupancy under leases or permits which will provide adequate safeguards for all public interests involved; provided that the homestead laws should continue to be operative, but only in the case of those lands which are shown by competent examination and classification to promise definitely a satisfactory standard of living.

4. The Secretary of the department of the government charged with the administration of this remaining public domain should be authorized to exchange any of the lands therein with states and private owners for lands of equal value where the public interest will be served by consolidating ownerships for more effective utilization or administration.

5. It is felt that adequate responsibility and authority lie in the Secretary of Agriculture to initiate proper action in the case of any eliminations of land from the national forests which the facts indicate to be desirable. However, should Congress deem it desirable to set up an additional agency to consider such cases, it is felt that this function can be best exercised by the National Forest Reservation Commission.

FRANKLIN REED,
Executive Secretary.

FINANCIAL CONTROL TO STABILIZE FOREST OWNERSHIP AND INDUSTRIES

The following letter is the combined effort of the President and Executive Secretary. It is the outcome of an extended conference between William L. Hall and the Executive Secretary, following the recent winter meeting of the Ozark Section.

Obviously there is much more to follow. This initial letter intentionally hits only the high spots, to attract the attentive ear of the banking interests, so that they will listen readily to further amplification of the proposition in detail.

April 8, 1932.

General Charles G. Dawes, *Director*,
Reconstruction Finance Corporation,
Washington, D. C.

Dear General Dawes:

In view of the probability that the forest industries will seek aid from the Reconstruction Finance Corporation, the Society of American Foresters desires to present the following matters for your consideration.

The forest industries rank second in importance among all industries as to employment. They represent, in round numbers $10,000,000,000 of invested capital. The harvesting of timber, the manufacture, transportation, distribution, and remanufacture of forest products, and all the supplies and services that are wholly or partly dependent on the timber industries, vitally affect the livelihood of at least ten million people and give direct employment to practically 2,000,000 wage earners. For their raw material they utilize the timber growing upon 500,000,000 acres of the nation's land area. The large extent to which they contribute to railroad traffic, taxes, community stability, etc., is obvious. The forest industries are closely allied to agriculture in that they use a growing product of the land and as a form of land use forest growing ranks second to agriculture. One branch, in fact, the naval stores industry, has

definitely been classified by act of Congress as a branch of agriculture.

That the forest industries have long been in a condition of chronic instability is a fact too commonly known to require amplification here. The President's Timber Conservation Board has been engaged for the past fifteen months in a study of the economic problems involved.

That the heretofore prevailing system of financing the ownership and exploitation of forest properties has been a strong contributing factor to the instability of the forest industries is a point which may well engage attention of the Reconstruction Finance Corporation.

In financial circles timber has always been regarded as a "wasting resource." In a forest investment, only the standing timber of commercial size and quality has been accorded value. With its removal the cut over land has been rated as worthless, except in those rare instances where it might be resold for other than forest purposes. Under such a conception the financial plan has always called for the progressive writing off of the capital investment, or liquidation of the loan against it, in step with the removal of the commercial timber. Naturally the spread between final sale price on the one side and logging, manufacturing, and selling costs, on the other, for each one thousand feet of lumber, or other unit produced, must be sufficient to contribute its prorata share to the necessary sinking fund.

Such financial plans have often been carried through to successful completion. Of recent years, however, instances where the spread between sale price and production cost has proved too narrow are occurring with increasing frequency. Cases can be cited where the margin of operating profit, as forecast in the original paper calculations, failed to materialize at all, with the result that the bonds are still outstanding, and with no asset behind them but a tract of worthless stump land and an obsolete sawmill.

That the promised operating profit failed to materialize may have been due to unforeseeable and uncontrollable economic conditions. That the logging methods used were such as to destroy all value in the forest property, leaving no security in support of the unliquidated bonds, is something that the financial backers might, and in their own interest, should have guarded against.

That economical logging of the commercial timber inevitably requires complete destruction of all value in the forest is an outworn misconception, disproven by the practical experience of recent years. It has been demonstrated in specific instances that the principles of selective logging properly applied, will not only leave intact, for increment in volume and value, the low-value, or minus-value, portion of the stand, but also will result in a lower unit production cost and higher sales values of the current merchantable timber. Studies of specific tracts have shown that logging only of the timber with a plus value, as of today, leaves the operator a profit instead of a loss and potential assets in the uncut timber.

Of the timber owning and manufacturing companies who may apply through their banks to the Reconstruction Finance Corporation for financial relief, most if not all, will be found to be operating under a progressive liquidation financial plan which calls for the eventually complete destruction of all value in their forest properties and disregards entirely the principle of sustained yield. Additional loans, even from the Reconstruction Finance Corporation, could not insure the required spread between sales price and production cost. But a loan premised on abandonment of present liquidating methods and the substitution therefore of a system of selective logging with sustained yield would lessen the need for so wide a margin and furnish added security for the loan itself. There is also the very real, if non-measurable, asset in the "good-will and going concern" values which would be thus built up.

The National Lumber Manufacturers Association in its statement of Forest Policy, adopted by its Board of Directors in August, 1929, has the following to say:

"The practice of forestry offers the

prospect of gain in one or more of the following ways:

"1. Direct profit from the growing of successive timber crops; (a) by insuring sustained supply of raw materials; (b) by sale of stumpage, as it matures to commercial size and quality, on the open market; or (c) by giving the lands a higher sale value.

"2. Avoidance of the dulling effects of public regulation.

"3. A present aid to the profitable sale of lumber and other forest products."

Not all forest properties are so situated that they can be placed on a sustained yield basis. Practically all could, however, be more profitably cut under selective logging principles. To the extent that operators may be aided, encouraged, or even forced, by their bankers to adopt either or both practices will the stability of the forest industries and all that depends thereon be furthered.

While the Reconstruction Finance Corporation with its limited life may be unable to go far itself in developing sounder financing and operation of forest enterprises, it will have taken a very constructive step if it can set in motion the development of such a practice on the part of banks and investment bankers.

I feel confident the soundness of this proposition will appeal to you. No doubt your war experience in France gave you, as it did to many of us, a good insight into the sound and permanent values which can be built up by forestry operations put on a permanent basis.

Very sincerely yours,

C. M. Granger,
President.

R. S. Hosmer Elected Fellow

R. S. Hosmer, Professor of Forestry, Cornell University, was elected a Fellow of the Society of American Foresters, effective January, 1932.

William Willard Ashe
1872-1932

The untimely death of William Willard Ashe on March 18, 1932 is a tragic loss to forestry. His contributions were outstanding in problems of forest management in the South, in land and timber surveys and appraisals in national forest acquisition, and in the discovery of many new species of trees east of the Rocky Mountains. Had he been less unselfish and modest in making claims for himself his achievements would have brought him wider national recognition.

Ashe was born in Raleigh, N. C., on June 4, 1872. He obtained the B. Litt. degree from the University of North Carolina in 1891 and the M. S. degree from Cornell in 1892. He became a member of the Society in 1907, serving it as vice-president in 1919 and as a member of many committees. He was married in 1906 to Mrs. Margaret Wilcox.

He was a pioneer in forestry not only in his native state of North Carolina but later in the U. S. Forest Service. Back in the nineties as a young man he was associated with Gifford Pinchot in North Carolina and conducted studies of forest conditions and made investigations whose results are published in a number of state bulletins. These include pioneer experiments in 1894 and 1895 for two seasons in hanging turpentine cups on longleaf pines. By sending samples of the crude gum for analyses to the chemical laboratory of the North Carolina State University, Ashe became influential in interesting Dr. Charles H. Herty, then a professor in chemistry, who has always acknowledged this influence in connection with his later well-known studies and demonstrations of turpentining by the cup-and-gutter system. Ashe first worked out the problem of successfully planting the heavy-taprooted longleaf pine by means of using year-old seedlings. He

was State Forester of North Carolina in 1903 and 1904.

Ashe's career in the U. S. Forest Service beginning in 1905 was eminently productive. He became an outstanding authority on forest types and vegetation of the southeastern States. His favorite avocation was the study of its flora and in this field of knowledge he had few equals. He discovered over 100 new species of plants, including trees. Numerous species of plants commemorate his name. In the extensive study of forest conditions throughout New England and the southern Appalachians which preceded the passage of the Forest Acquisition Law (The Weeks Law of June 1911) Ashe's services were of the highest value, and during the twenty years that have since elapsed he has been directly connected with and responsible for the recommendation of all lands for purchase as national forests in the eastern United States. How creditable a job the Forest Service has done in the creation of these national forests is a matter of common knowledge and very much of the credit belongs to Ashe.

W. W. Ashe

He was an authority on the technique and management of the forests in the southern states. Much of this technique he worked out for himself by observation and experimentation in connection with his administrative duties. His timber appraisal activities led into a careful study of the comparative costs of logging and milling different sized timber and he became the pioneer authority on logging costs in the southeastern United States. Out of this economic timber—selection study developed probably his greatest contribution to forestry, in which he conclusively showed the money loss of cutting small-sized trees. He was directly instrumental in getting one after another large southern lumber concerns to adopt scientific principles of timber cutting.

The Society has lost a member of outstanding achievement.

W. R. Mattoon,
U. S. Forest Service.

European Excursions in 1932

Two coöperative excursions through Europe are being organized for the summer of 1932, the programs of which present some unusually attractive features and the costs of which will be moderate. While intended primarily for entomologists attending the Fifth International Congress of Entomology at Paris in July, and for their families and friends, other scientific men, up to certain limits, will be welcome.

Readers of this notice, who may be going to Europe, even though not as members of one of the groups, are welcome to share in certain advantageous arrangements which the committee has been able to make, provided they request the com-

mittee to obtain their steamship reservations for them.

For complete circulars and information address the undersigned, who is chairman of the Joint Committee of the Entomological Society of America and Association of Economic Entomologists on transportation to Europe.

O. A. JOHANNSEN,
Roberts Hall, Ithaca, N. Y.

APPRECIATION OF ARTHUR RINGLAND

"I should like to emphasize the great pleasure we take in having Mr. Ringland as standing representative of American forestry here in Berlin. We have already found many questions which we will work on together in the future, and I am convinced that through his activity an extraordinarily good and effective contact will be established between American and European forestry. As Mr. Ringland will probably tell you, it is our thought to put this coöperation on a firmer basis for the future, which is the more necessary since, unfortunately, these tasks of international exchange of experience in the field of forestry have, heretofore, not been dealt with in a sufficiently successful manner by those in charge of international affairs. . . ."[1]

[1]Translated extract from letter by Dr. J. A. von Monroy, Chairman of the Committee on Foreign Affairs of the *Deutsche Forstverein*, to Professor R. S. Hosmer, Cornell University. Dated Berlin, Germany, March 5, 1932.

ELECTIONS TO MEMBERSHIP

The following men have been elected to the grade of membership indicated.

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Junior Membership

Casey, Abner

Senior Membership

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Announcement of Candidates for Membership

The following names of candidates for membership are referred to Junior Members, Senior Members and Fellows for comment or protest. The list includes all nominations received since the publication of the list in the April Journal, without question as to eligibility; the names have not been passed upon by the Council. Important information regarding the qualifications of any candidate, which will enable the Council to take final action with a knowledge of essential facts, should be submitted to the undersigned before June 15, 1932. Statements on different men should be submitted on different sheets. Communications relating to candidates are considered by the Council as strictly confidential.

FOR ELECTION TO GRADE OF JUNIOR MEMBERSHIP

Name and Education	*Title and Address*	*Proposed by*
Hebb, Harold C. Berea College; Univ. of Ga., B. S. F., '31.	Management plan and timber survey work, White Mountain Natl. Forest, Laconia, N. H.	New England Section
Kuehn, Charles Chancey Harvard Univ., B. S., '30; Yale School Forestry, '30-'31.	Asst. Forest Supervisor, Ga. Forest Products Co., Woodbine, Ga.	Southeastern Section
McCasland, Herbert J. N. Y. State, B. S. F., '24.	Blister Rust Agt., U. S. Dept. Agri., Averill Park, N. Y.	New York Section
Robertson, Melvin L. 6 mos. Bus. Course, Kalispell, Mont.; Acct. Course, LaSalle Extension Univ.; High Sch. Course, American Sch.	Asst. Forest Supervisor, Nespelem, Washington.	North. Rocky Mtn. Sec.
Root, George A. Conn. Agr., B. S., '12; Mass. Agr., M. S., '15.	State leader of Blister Rust activities, Sacramento, Calif.	California Section
Walker, Carl E. Univ. N. H., B. S., '29; M. S., '31.	Univ. of N. H., Durham, N. H.	New England Section
Wood, Roger V. No education given.	State Forest Supervisor, Bakersfield, Calif.	California Section

FOR ELECTION TO GRADE OF SENIOR MEMBERSHIP

Faulknew, George A. Syracuse 1 yr.; U. of Me., B. S. F., '19. (Junior member, 1923.)	Supervisor, Maine Forest Service, Augusta, Maine.	New England Section
Gruhn, George H. Univ. of Me., B. S. (Junior member, 1927.)	Supervisor, Maine Forest Service, Augusta, Maine.	New England Section
Merrill, Julian H. Univ. of Me., B. S. F., '24. (Junior member, 1924.)	Manager, Forest Fire Protection, New Brunswick International Paper Co., Restigouche Valley, N. B.	New England Section

C. F. Korstian,
Member of Council in Charge of Admissions.

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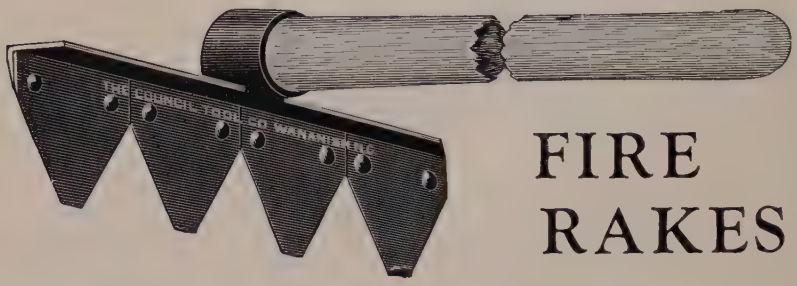

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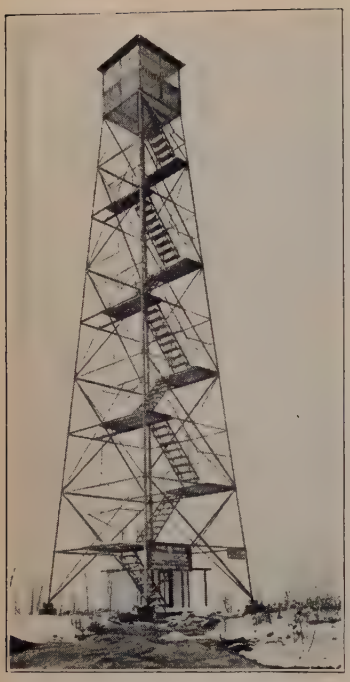

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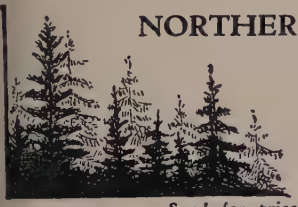

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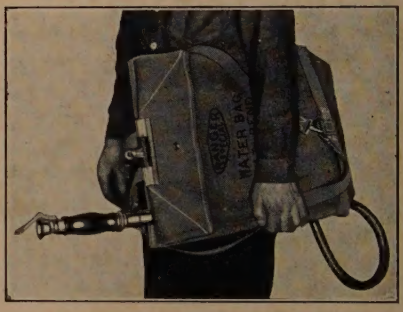

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